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=> FIL WPIX
FILE 'WPIX' ENTERED AT 14:19:06 ON 19 MAR 2010
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'BI ABEX' IS DEFAULT SEARCH FIELD FOR 'WPIX' FILE

=> D HIS NOFILE

     INDEX '1MOBILITY, 2MOBILITY, ABI-INFORM, ADISCTI, AEROSPACE,
     AGRICOLA, ALUMINIUM, ANABSTR, ANTE, APOLLIT, AQUALINE, AQUASCI,
     AQUIRE, BABS, BIBLIODATA, BIOENG, BIOSIS, BIOTECHABS, BIOTECHDS,
     BIOTECHNO, CABA, CAPLUS, CASREACT, CBNB, CEABA-VTB, CERAB,
     CHEMINFORMRX,' ENTERED AT 13:37:52 ON 19 MAR 2010
                SEA CATALY? AND BED?
               ---------
             215   FILE 1MOBILITY
            1208   FILE ABI-INFORM
            3931   FILE AEROSPACE
             164   FILE AGRICOLA
             218   FILE ALUMINIUM
              54   FILE ANABSTR
             701   FILE ANTE
            1949   FILE APOLLIT
             198   FILE AQUALINE
              55   FILE AQUASCI
             353   FILE BABS
               3   FILE BIBLIODATA
             312   FILE BIOENG
             835   FILE BIOSIS
             410   FILE BIOTECHABS
             410   FILE BIOTECHDS
             392   FILE BIOTECHNO
             476   FILE CABA
           40618   FILE CAPLUS
            2613   FILE CASREACT
             419   FILE CBNB
           12016   FILE CEABA-VTB
              86   FILE CERAB
              13   FILE CHEMINFORMRX
             256   FILE CIN
             524   FILE CIVILENG
           10096   FILE COMPENDEX
             126   FILE COMPUAB
               8   FILE COMPUSCIENCE
             154   FILE CONFSCI
              31   FILE COPPERLIT
              44   FILE CORROSION
               6   FILE CROPU
              47   FILE CSNB
               2   FILE DDFB
               5   FILE DDFU
               1   FILE DETHERM
             156   FILE DGENE
             915   FILE DISSABS
             244   FILE DKF
               2   FILE DRUGB
              22   FILE DRUGU
             141   FILE ELCOM
             509   FILE EMA
              12   FILE EMBAL
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886	FILE EMBASE
17286	FILE ENCOMPLIT
15091	FILE ENCOMPPAT
9439	FILE ENERGY
423	FILE ENVIROENG
62110	FILE EPFULL
704	FILE ESBIOBASE
269	FILE FRANCEPAT
2930	FILE FRFULL
113	FILE FROSTI
185	FILE FSTA
19059	FILE GBFULL
76	FILE GENBANK
76	FILE GEOREF
30	FILE HEALSAFE
6	FILE IFICLS
14461	FILE IFIPAT
1	FILE INFODATA
766	FILE INIS
19390	FILE INPADOCDB
14243	FILE INPAFAMDB
1480	FILE INSPEC
91	FILE INSPHYS
4	FILE IPA
76	FILE ITRD
2622	FILE JAPIO
277	FILE KOREAPAT
10	FILE KOSMET
303	FILE LIFESCI
1	FILE LISA
25	FILE MATBUS
871	FILE MECHENG
587	FILE MEDLINE
562	FILE METADEX
1375	FILE NLDB
1837	FILE NTIS
13	FILE OCEAN
7592	FILE PASCAL
8	FILE PATDPA
6680	FILE PATDPAFULL
2689	FILE PCI
43905	FILE PCTFULL
93	FILE PIRA
274	FILE POLLUAB
4598	FILE PROMT
460	FILE RAPRA
144	FILE RDISCLOSURE
395	FILE RUSSIAPAT
9784	FILE SCISEARCH
754	FILE SOLIDSTATE
43	FILE SOLIS
85	FILE SYNTHLINE
2224	FILE TEMA
40	FILE TEXTILETECH
5734	FILE TOXCENTER
3	FILE TRIBO
866	FILE TULSA
655	FILE TULSA2
384	FILE UFORDAT
1255	FILE ULIDAT

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           97628   FILE USPATFULL
           19420   FILE USPATOLD
           16880   FILE USPAT2
             184   FILE WATER
               7   FILE WELDASEARCH
           19771   FILE WPIDS
              76   FILE WPIFV
           19771   FILE WPINDEX
              91   FILE WSCA
              40   FILE WTEXTILES
L1               QUE SPE=ON  ABB=ON  PLU=ON  CATALY? AND BED?
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     FILE 'WPIX' ENTERED AT 13:43:57 ON 19 MAR 2010
L2               QUE SPE=ON  ABB=ON  PLU=ON  REACT?/BI,ABEX
L3         17180 SEA SPE=ON  ABB=ON  PLU=ON  ?EXOTHERM?/BI,ABEX OR EXO/BI,AB
                 EX (2A) THERM?/BI,ABEX
L4          7702 SEA SPE=ON  ABB=ON  PLU=ON  ?ISOTHERM?/BI,ABEX OR ISO/BI,AB
                 EX (2A) THERM?/BI,ABEX
L5               QUE SPE=ON  ABB=ON  PLU=ON  CAT#/BI,ABEX OR CATALY?/BI,ABEX

L6        190526 SEA SPE=ON  ABB=ON  PLU=ON  BED?/BI,ABEX
L7               QUE SPE=ON  ABB=ON  PLU=ON  DISTRIBUT?/BI,ABEX OR SUPPLY?/B
                 I,ABEX OR PROVID?/BI,ABEX OR INJECT?/BI,ABEX OR INSERT?/BI,
                 ABEX OR PLACE#/BI,ABEX OR PLACED#/BI,ABEX OR PLACING?/BI,AB
                 EX OR INTRODUC?/BI,ABEX
L8        188820 SEA SPE=ON  ABB=ON  PLU=ON  HEAT?/BI,ABEX (2A) EXCHANG?/BI,
                 ABEX
L9         37413 SEA SPE=ON  ABB=ON  PLU=ON  NITRIC?/BI,ABEX (2A) ACID?/BI,A
                 BEX OR HNO3/BI,ABEX
L10        71248 SEA SPE=ON  ABB=ON  PLU=ON  FORMALDEHYDE?/BI,ABEX OR
                 CH2O/BI,ABEX
L11       859951 SEA SPE=ON  ABB=ON  PLU=ON  OXID#/BI,ABEX OR OXIDAT?/BI,ABE
                 X
                 E CALYTON K/AU
                 E CLAYTON K/AU
L12            8 SEA SPE=ON  ABB=ON  PLU=ON  "CLAYTON K"/AU
                 E CLAYTON K A/AU
L13            2 SEA SPE=ON  ABB=ON  PLU=ON  "CLAYTON K A"/AU
                 E FILIPPI E/AU
L14           80 SEA SPE=ON  ABB=ON  PLU=ON  "FILIPPI E"/AU
                 E JAROZZO M/AU
L15            1 SEA SPE=ON  ABB=ON  PLU=ON  (JAROZZO/AU OR "JAROZZO M"/AU)
                 E RIZZI E/AU
L16           69 SEA SPE=ON  ABB=ON  PLU=ON  "RIZZI E"/AU
                 E TAROZZO M/AU
L17           44 SEA SPE=ON  ABB=ON  PLU=ON  (TAROZZO/AU OR "TAROZZO M"/AU)
L18          113 SEA SPE=ON  ABB=ON  PLU=ON  (L12 OR L13 OR L14 OR L15 OR
                 L16 OR L17)
                 E AMMONIA CASALE SA+ALL/PACO
L19          149 SEA SPE=ON  ABB=ON  PLU=ON  AMMO-N/PACO
L20         9637 SEA SPE=ON  ABB=ON  PLU=ON  L2 AND L3
L21         9637 S L20 AND L3
L21          110 SEA SPE=ON  ABB=ON  PLU=ON  L20 AND L4
L22       237884 SEA SPE=ON  ABB=ON  PLU=ON  L2 AND L5
L23        14627 SEA SPE=ON  ABB=ON  PLU=ON  L22 AND L6
L24          556 SEA SPE=ON  ABB=ON  PLU=ON  L23 AND L3
L25           20 SEA SPE=ON  ABB=ON  PLU=ON  L24 AND L4
L26          161 SEA SPE=ON  ABB=ON  PLU=ON  L24 AND L8
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L27          120 SEA SPE=ON  ABB=ON  PLU=ON  L26 AND L7
L28            2 SEA SPE=ON  ABB=ON  PLU=ON  L27 AND L9
L29            5 SEA SPE=ON  ABB=ON  PLU=ON  L27 AND L10
L30        97339 SEA SPE=ON  ABB=ON  PLU=ON  (B01J0019 OR B01J0008 OR
                 C01B0021 OR C07C0045 OR F28D0009)/IPC
L31        22081 SEA SPE=ON  ABB=ON  PLU=ON  (J04-E01 OR J04-E06 OR N06-D
                 OR N07-A)/MC
L32         3001 SEA SPE=ON  ABB=ON  PLU=ON  L20 AND L5
L33          556 SEA SPE=ON  ABB=ON  PLU=ON  L32 AND L6
L34          161 SEA SPE=ON  ABB=ON  PLU=ON  L33 AND L8
L35           46 SEA SPE=ON  ABB=ON  PLU=ON  L21 AND (L30 OR L31)
L36          318 SEA SPE=ON  ABB=ON  PLU=ON  L24 AND (L30 OR L31)
L37           11 SEA SPE=ON  ABB=ON  PLU=ON  L36 AND (L9 OR L10)
L38          123 SEA SPE=ON  ABB=ON  PLU=ON  L26 AND (L30 OR L31)
L39          123 S L38 AND L8
L39            6 SEA SPE=ON  ABB=ON  PLU=ON  L38 AND (L9 OR L10)
L40           61 SEA SPE=ON  ABB=ON  PLU=ON  L25 OR L28 OR L29 OR L35 OR
                 L37 OR L39
L41           38 SEA SPE=ON  ABB=ON  PLU=ON  L40 AND L8
L42           13 SEA SPE=ON  ABB=ON  PLU=ON  L41 AND (L18 OR L19)
L43            0 S L41 NOT L41
L43           25 SEA SPE=ON  ABB=ON  PLU=ON  L41 NOT L42
L44           17 SEA SPE=ON  ABB=ON  PLU=ON  1808-2002/PY,PRY,AY AND L43
L45         1234 SEA SPE=ON  ABB=ON  PLU=ON  L23 AND  L8
L46          461 SEA SPE=ON  ABB=ON  PLU=ON  L45 AND L11
L47          345 SEA SPE=ON  ABB=ON  PLU=ON  L46 AND L7
L48          184 SEA SPE=ON  ABB=ON  PLU=ON  L47 AND (L30 OR L31)
L49            8 SEA SPE=ON  ABB=ON  PLU=ON  L48 AND  L4
L50            2 SEA SPE=ON  ABB=ON  PLU=ON  L49 AND (L18 OR L19)
L51           13 SEA SPE=ON  ABB=ON  PLU=ON  L50 OR L42
L52            5 SEA SPE=ON  ABB=ON  PLU=ON  L49 NOT (L44 OR L51)
L53            2 SEA SPE=ON  ABB=ON  PLU=ON  1808-2002/PY,PRY,AY AND L52



     FILE 'CEABA-VTB, COMPENDEX, ENERGY, PASCAL, JAPIO, TEMA, NTIS,
     DISSABS, TULSA' ENTERED AT 14:10:41 ON 19 MAR 2010
     FILE 'CEABA-VTB'
L54         2416 SEA SPE=ON  ABB=ON  PLU=ON  L2 AND L3
     FILE 'COMPENDEX'
L55         9679 SEA SPE=ON  ABB=ON  PLU=ON  L2 AND L3
     FILE 'ENERGY'
L56         4623 SEA SPE=ON  ABB=ON  PLU=ON  L2 AND L3
     FILE 'PASCAL'
L57         5721 SEA SPE=ON  ABB=ON  PLU=ON  L2 AND L3
     FILE 'JAPIO'
L58         1340 SEA SPE=ON  ABB=ON  PLU=ON  L2 AND L3
     FILE 'TEMA'
L59         2319 SEA SPE=ON  ABB=ON  PLU=ON  L2 AND L3
     FILE 'NTIS'
L60         1394 SEA SPE=ON  ABB=ON  PLU=ON  L2 AND L3
     FILE 'DISSABS'
L61          799 SEA SPE=ON  ABB=ON  PLU=ON  L2 AND L3
     FILE 'TULSA'
L62          245 SEA SPE=ON  ABB=ON  PLU=ON  L2 AND L3
     TOTAL FOR ALL FILES
L63        28536 SEA SPE=ON  ABB=ON  PLU=ON  L2 AND L3
     FILE 'CEABA-VTB'
L64        64773 SEA SPE=ON  ABB=ON  PLU=ON  CAT#/BI,ABEX OR CATALY?/BI,ABEX
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     FILE 'COMPENDEX'
L65       237708 SEA SPE=ON  ABB=ON  PLU=ON  CAT#/BI,ABEX OR CATALY?/BI,ABEX

     FILE 'ENERGY'
L66       138812 SEA SPE=ON  ABB=ON  PLU=ON  CAT#/BI,ABEX OR CATALY?/BI,ABEX

     FILE 'PASCAL'
L67       330911 SEA SPE=ON  ABB=ON  PLU=ON  CAT#/BI,ABEX OR CATALY?/BI,ABEX

     FILE 'JAPIO'
L68       146261 SEA SPE=ON  ABB=ON  PLU=ON  CAT#/BI,ABEX OR CATALY?/BI,ABEX

     FILE 'TEMA'
L69        32603 SEA SPE=ON  ABB=ON  PLU=ON  CAT#/BI,ABEX OR CATALY?/BI,ABEX

     FILE 'NTIS'
L70        27404 SEA SPE=ON  ABB=ON  PLU=ON  CAT#/BI,ABEX OR CATALY?/BI,ABEX

     FILE 'DISSABS'
L71        46949 SEA SPE=ON  ABB=ON  PLU=ON  CAT#/BI,ABEX OR CATALY?/BI,ABEX

     FILE 'TULSA'
L72         8020 SEA SPE=ON  ABB=ON  PLU=ON  CAT#/BI,ABEX OR CATALY?/BI,ABEX

     TOTAL FOR ALL FILES
L73      1033441 SEA SPE=ON  ABB=ON  PLU=ON  L5
     FILE 'CEABA-VTB'
L74        81420 SEA SPE=ON  ABB=ON  PLU=ON  BED?/BI,ABEX
     FILE 'COMPENDEX'
L75        99682 SEA SPE=ON  ABB=ON  PLU=ON  BED?/BI,ABEX
     FILE 'ENERGY'
L76       116719 SEA SPE=ON  ABB=ON  PLU=ON  BED?/BI,ABEX
     FILE 'PASCAL'
L77       109752 SEA SPE=ON  ABB=ON  PLU=ON  BED?/BI,ABEX
     FILE 'JAPIO'
L78        54075 SEA SPE=ON  ABB=ON  PLU=ON  BED?/BI,ABEX
     FILE 'TEMA'
L79       200112 SEA SPE=ON  ABB=ON  PLU=ON  BED?/BI,ABEX
     FILE 'NTIS'
L80        30509 SEA SPE=ON  ABB=ON  PLU=ON  BED?/BI,ABEX
     FILE 'DISSABS'
L81        15406 SEA SPE=ON  ABB=ON  PLU=ON  BED?/BI,ABEX
     FILE 'TULSA'
L82        79629 SEA SPE=ON  ABB=ON  PLU=ON  BED?/BI,ABEX
     TOTAL FOR ALL FILES
L83       787304 SEA SPE=ON  ABB=ON  PLU=ON  L6
     FILE 'CEABA-VTB'
L84        14352 SEA SPE=ON  ABB=ON  PLU=ON  HEAT?/BI,ABEX (2A) EXCHANG?/BI,
                 ABEX
     FILE 'COMPENDEX'
L85        72346 SEA SPE=ON  ABB=ON  PLU=ON  HEAT?/BI,ABEX (2A) EXCHANG?/BI,
                 ABEX
     FILE 'ENERGY'
L86        52587 SEA SPE=ON  ABB=ON  PLU=ON  HEAT?/BI,ABEX (2A) EXCHANG?/BI,
                 ABEX
     FILE 'PASCAL'
L87        20559 SEA SPE=ON  ABB=ON  PLU=ON  HEAT?/BI,ABEX (2A) EXCHANG?/BI,
                 ABEX
     FILE 'JAPIO'
L88        86379 SEA SPE=ON  ABB=ON  PLU=ON  HEAT?/BI,ABEX (2A) EXCHANG?/BI,
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                ABEX
     FILE 'TEMA'
L89        25340 SEA SPE=ON  ABB=ON  PLU=ON  HEAT?/BI,ABEX (2A) EXCHANG?/BI,
                ABEX
     FILE 'NTIS'
L90        11213 SEA SPE=ON  ABB=ON  PLU=ON  HEAT?/BI,ABEX (2A) EXCHANG?/BI,
                ABEX
     FILE 'DISSABS'
L91         1660 SEA SPE=ON  ABB=ON  PLU=ON  HEAT?/BI,ABEX (2A) EXCHANG?/BI,
                ABEX
     FILE 'TULSA'
L92         5841 SEA SPE=ON  ABB=ON  PLU=ON  HEAT?/BI,ABEX (2A) EXCHANG?/BI,
                ABEX
     TOTAL FOR ALL FILES
L93       290277 SEA SPE=ON  ABB=ON  PLU=ON  L8
     FILE 'CEABA-VTB'
L94          854 SEA SPE=ON  ABB=ON  PLU=ON  L54 AND L64
     FILE 'COMPENDEX'
L95         1574 SEA SPE=ON  ABB=ON  PLU=ON  L55 AND L65
     FILE 'ENERGY'
L96          817 SEA SPE=ON  ABB=ON  PLU=ON  L56 AND L66
     FILE 'PASCAL'
L97          993 SEA SPE=ON  ABB=ON  PLU=ON  L57 AND L67
     FILE 'JAPIO'
L98          269 SEA SPE=ON  ABB=ON  PLU=ON  L58 AND L68
     FILE 'TEMA'
L99          233 SEA SPE=ON  ABB=ON  PLU=ON  L59 AND L69
     FILE 'NTIS'
L100         130 SEA SPE=ON  ABB=ON  PLU=ON  L60 AND L70
     FILE 'DISSABS'
L101         190 SEA SPE=ON  ABB=ON  PLU=ON  L61 AND L71
     FILE 'TULSA'
L102          78 SEA SPE=ON  ABB=ON  PLU=ON  L62 AND L72
     TOTAL FOR ALL FILES
L103        5138 SEA SPE=ON  ABB=ON  PLU=ON  L63 AND L73
     FILE 'CEABA-VTB'
L104          64 SEA SPE=ON  ABB=ON  PLU=ON  L94 AND L84
     FILE 'COMPENDEX'
L105          96 SEA SPE=ON  ABB=ON  PLU=ON  L95 AND L85
     FILE 'ENERGY'
L106          72 SEA SPE=ON  ABB=ON  PLU=ON  L96 AND L86
     FILE 'PASCAL'
L107          51 SEA SPE=ON  ABB=ON  PLU=ON  L97 AND L87
     FILE 'JAPIO'
L108          32 SEA SPE=ON  ABB=ON  PLU=ON  L98 AND L88
     FILE 'TEMA'
L109          20 SEA SPE=ON  ABB=ON  PLU=ON  L99 AND L89
     FILE 'NTIS'
L110           7 SEA SPE=ON  ABB=ON  PLU=ON  L100 AND L90
     FILE 'DISSABS'
L111          12 SEA SPE=ON  ABB=ON  PLU=ON  L101 AND L91
     FILE 'TULSA'
L112          14 SEA SPE=ON  ABB=ON  PLU=ON  L102 AND L92
     TOTAL FOR ALL FILES
L113         368 SEA SPE=ON  ABB=ON  PLU=ON  L103 AND L93
     FILE 'CEABA-VTB'
L114          42 SEA SPE=ON  ABB=ON  PLU=ON  L104 AND L74
     FILE 'COMPENDEX'
L115          35 SEA SPE=ON  ABB=ON  PLU=ON  L105 AND L75
     FILE 'ENERGY'
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L116         27 SEA SPE=ON  ABB=ON  PLU=ON  L106 AND L76
     FILE 'PASCAL'
L117         22 SEA SPE=ON  ABB=ON  PLU=ON  L107 AND L77
     FILE 'JAPIO'
L118          9 SEA SPE=ON  ABB=ON  PLU=ON  L108 AND L78
     FILE 'TEMA'
L119          5 SEA SPE=ON  ABB=ON  PLU=ON  L109 AND L79
     FILE 'NTIS'
L120          5 SEA SPE=ON  ABB=ON  PLU=ON  L110 AND L80
     FILE 'DISSABS'
L121          8 SEA SPE=ON  ABB=ON  PLU=ON  L111 AND L81
     FILE 'TULSA'
L122          5 SEA SPE=ON  ABB=ON  PLU=ON  L112 AND L82
     TOTAL FOR ALL FILES
L123        158 SEA SPE=ON  ABB=ON  PLU=ON  L113 AND L83
     FILE 'CEABA-VTB'
L124      97381 SEA SPE=ON  ABB=ON  PLU=ON  DISTRIBUT?/BI,ABEX OR SUPPLY?/B
                I,ABEX OR PROVID?/BI,ABEX OR INJECT?/BI,ABEX OR INSERT?/BI,
                ABEX OR PLACE#/BI,ABEX OR PLACED#/BI,ABEX OR PLACING?/BI,AB
                EX OR INTRODUC?/BI,ABEX
     FILE 'COMPENDEX'
L125    2876630 SEA SPE=ON  ABB=ON  PLU=ON  DISTRIBUT?/BI,ABEX OR SUPPLY?/B
                I,ABEX OR PROVID?/BI,ABEX OR INJECT?/BI,ABEX OR INSERT?/BI,
                ABEX OR PLACE#/BI,ABEX OR PLACED#/BI,ABEX OR PLACING?/BI,AB
                EX OR INTRODUC?/BI,ABEX
     FILE 'ENERGY'
L126    1489584 SEA SPE=ON  ABB=ON  PLU=ON  DISTRIBUT?/BI,ABEX OR SUPPLY?/B
                I,ABEX OR PROVID?/BI,ABEX OR INJECT?/BI,ABEX OR INSERT?/BI,
                ABEX OR PLACE#/BI,ABEX OR PLACED#/BI,ABEX OR PLACING?/BI,AB
                EX OR INTRODUC?/BI,ABEX
     FILE 'PASCAL'
L127    2527965 SEA SPE=ON  ABB=ON  PLU=ON  DISTRIBUT?/BI,ABEX OR SUPPLY?/B
                I,ABEX OR PROVID?/BI,ABEX OR INJECT?/BI,ABEX OR INSERT?/BI,
                ABEX OR PLACE#/BI,ABEX OR PLACED#/BI,ABEX OR PLACING?/BI,AB
                EX OR INTRODUC?/BI,ABEX
     FILE 'JAPIO'
L128    5711209 SEA SPE=ON  ABB=ON  PLU=ON  DISTRIBUT?/BI,ABEX OR SUPPLY?/B
                I,ABEX OR PROVID?/BI,ABEX OR INJECT?/BI,ABEX OR INSERT?/BI,
                ABEX OR PLACE#/BI,ABEX OR PLACED#/BI,ABEX OR PLACING?/BI,AB
                EX OR INTRODUC?/BI,ABEX
     FILE 'TEMA'
L129     557090 SEA SPE=ON  ABB=ON  PLU=ON  DISTRIBUT?/BI,ABEX OR SUPPLY?/B
                I,ABEX OR PROVID?/BI,ABEX OR INJECT?/BI,ABEX OR INSERT?/BI,
                ABEX OR PLACE#/BI,ABEX OR PLACED#/BI,ABEX OR PLACING?/BI,AB
                EX OR INTRODUC?/BI,ABEX
     FILE 'NTIS'
L130     744512 SEA SPE=ON  ABB=ON  PLU=ON  DISTRIBUT?/BI,ABEX OR SUPPLY?/B
                I,ABEX OR PROVID?/BI,ABEX OR INJECT?/BI,ABEX OR INSERT?/BI,
                ABEX OR PLACE#/BI,ABEX OR PLACED#/BI,ABEX OR PLACING?/BI,AB
                EX OR INTRODUC?/BI,ABEX
     FILE 'DISSABS'
L131     703676 SEA SPE=ON  ABB=ON  PLU=ON  DISTRIBUT?/BI,ABEX OR SUPPLY?/B
                I,ABEX OR PROVID?/BI,ABEX OR INJECT?/BI,ABEX OR INSERT?/BI,
                ABEX OR PLACE#/BI,ABEX OR PLACED#/BI,ABEX OR PLACING?/BI,AB
                EX OR INTRODUC?/BI,ABEX
     FILE 'TULSA'
L132     319899 SEA SPE=ON  ABB=ON  PLU=ON  DISTRIBUT?/BI,ABEX OR SUPPLY?/B
                I,ABEX OR PROVID?/BI,ABEX OR INJECT?/BI,ABEX OR INSERT?/BI,
                ABEX OR PLACE#/BI,ABEX OR PLACED#/BI,ABEX OR PLACING?/BI,AB
                EX OR INTRODUC?/BI,ABEX
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     TOTAL FOR ALL FILES
L133   15027946 SEA SPE=ON  ABB=ON  PLU=ON  L7
     FILE 'CEABA-VTB'
L134         12 SEA SPE=ON  ABB=ON  PLU=ON  L114 AND L124
     FILE 'COMPENDEX'
L135         15 SEA SPE=ON  ABB=ON  PLU=ON  L115 AND L125
     FILE 'ENERGY'
L136         11 SEA SPE=ON  ABB=ON  PLU=ON  L116 AND L126
     FILE 'PASCAL'
L137         13 SEA SPE=ON  ABB=ON  PLU=ON  L117 AND L127
     FILE 'JAPIO'
L138          8 SEA SPE=ON  ABB=ON  PLU=ON  L118 AND L128
     FILE 'TEMA'
L139          3 SEA SPE=ON  ABB=ON  PLU=ON  L119 AND L129
     FILE 'NTIS'
L140          0 SEA SPE=ON  ABB=ON  PLU=ON  L120 AND L130
     FILE 'DISSABS'
L141          3 SEA SPE=ON  ABB=ON  PLU=ON  L121 AND L131
     FILE 'TULSA'
L142          4 SEA SPE=ON  ABB=ON  PLU=ON  L122 AND L132
     TOTAL FOR ALL FILES
L143         69 SEA SPE=ON  ABB=ON  PLU=ON  L123 AND L133
     FILE 'CEABA-VTB'
L144          6 SEA SPE=ON  ABB=ON  PLU=ON  1808-2002/PY,PRY,AY AND L134
     FILE 'COMPENDEX'
L145          5 SEA SPE=ON  ABB=ON  PLU=ON  1808-2002/PY,PRY,AY AND L135
     FILE 'ENERGY'
L146          7 SEA SPE=ON  ABB=ON  PLU=ON  1808-2002/PY,PRY,AY AND L136
     FILE 'PASCAL'
L147         11 SEA SPE=ON  ABB=ON  PLU=ON  1808-2002/PY,PRY,AY AND L137
     FILE 'JAPIO'
L148          5 SEA SPE=ON  ABB=ON  PLU=ON  1808-2002/PY,PRY,AY AND L138
     FILE 'TEMA'
L149          1 SEA SPE=ON  ABB=ON  PLU=ON  1808-2002/PY,PRY,AY AND L139
     FILE 'NTIS'
L150          0 SEA SPE=ON  ABB=ON  PLU=ON  1808-2002/PY,PRY,AY AND L140
     FILE 'DISSABS'
L151          3 SEA SPE=ON  ABB=ON  PLU=ON  1808-2002/PY,PRY,AY AND L141
     FILE 'TULSA'
L152          3 SEA SPE=ON  ABB=ON  PLU=ON  1808-2002/PY,PRY,AY AND L142
     TOTAL FOR ALL FILES
L153         41 SEA SPE=ON  ABB=ON  PLU=ON  1808-2002/PY,PRY,AY AND L143
L154         36 DUP REM L153 (5 DUPLICATES REMOVED)
                     ANSWERS '1-6' FROM FILE CEABA-VTB
                     ANSWERS '7-11' FROM FILE COMPENDEX
                     ANSWERS '12-18' FROM FILE ENERGY
                     ANSWERS '19-24' FROM FILE PASCAL
                     ANSWERS '25-29' FROM FILE JAPIO
                     ANSWER '30' FROM FILE TEMA
                     ANSWERS '31-33' FROM FILE DISSABS
                     ANSWERS '34-36' FROM FILE TULSA


     FILE 'CEABA-VTB, COMPENDEX, ENERGY, PASCAL, JAPIO, TEMA, DISSABS,
     TULSA' ENTERED AT 14:18:33 ON 19 MAR 2010
     FILE 'CEABA-VTB'
L144          6 S 1808-2002/PY,PRY,AY AND L143
L144          6 S 1808-2002/PY,PRY,AY AND L143
L155          6 SEA L154
     FILE 'COMPENDEX'
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L145          5 S 1808-2002/PY,PRY,AY AND L143
L145          5 S 1808-2002/PY,PRY,AY AND L143
L156          5 SEA L154
     FILE 'ENERGY'
L146          7 S 1808-2002/PY,PRY,AY AND L143
L146          7 S 1808-2002/PY,PRY,AY AND L143
L157          7 SEA L154
     FILE 'PASCAL'
L147         11 S 1808-2002/PY,PRY,AY AND L143
L147         11 S 1808-2002/PY,PRY,AY AND L143
L158          6 SEA L154
     FILE 'JAPIO'
L148          5 S 1808-2002/PY,PRY,AY AND L143
L148          5 S 1808-2002/PY,PRY,AY AND L143
L159          5 SEA L154
     FILE 'TEMA'
L149          1 S 1808-2002/PY,PRY,AY AND L143
L149          1 S 1808-2002/PY,PRY,AY AND L143
L160          1 SEA L154
     FILE 'DISSABS'
L151          3 S 1808-2002/PY,PRY,AY AND L143
L151          3 S 1808-2002/PY,PRY,AY AND L143
L161          3 SEA L154
     FILE 'TULSA'
L152          3 S 1808-2002/PY,PRY,AY AND L143
L152          3 S 1808-2002/PY,PRY,AY AND L143
L162          3 SEA L154
     TOTAL FOR ALL FILES
L163         36 SEA SPE=ON  ABB=ON  PLU=ON  L154



     FILE 'WPIX' ENTERED AT 14:19:06 ON 19 MAR 2010

=> D L51 1-13 IFULL

L51  ANSWER 1 OF 13  WPIX COPYRIGHT 2010       THOMSON REUTERS on STN
ACCESSION NUMBER:      2009-M65565 [56]   WPIX
TITLE:                 Chemical isothermal reactor
                       useful in methanol synthesis plants, comprises a
                       plate heat exchanger with an
                       annular structure comprising heat-
                       exchange radial plates having internal
                       passages for an heat exchange
                       fluid and radial ducts
DERWENT CLASS:         E17; J04; Q78; X25
INVENTOR:              FILIPPI E; RIZZI E; TAROZZO
                       M
PATENT ASSIGNEE:       (METH-N) METHANOL CASALE SA
COUNTRY COUNT:         123

PATENT INFORMATION:

      PATENT NO      KIND DATE     WEEK      LA  PG          MAIN IPC
      ---------------------------------------------------------------
      EP 2090355      A1 20090819 (200956)* EN  13[7]
      WO 2009103461   A1 20090827 (200957)  EN

APPLICATION DETAILS:
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PATENT NO	KIND	APPLICATION	DATE
EP 2090355 A1		EP 2008-2925	20080218
WO 2009103461 A1		WO 2009-EP1046	20090213

PRIORITY APPLN. INFO: EP 2008-2925 20080218
INT. PATENT CLASSIF.:
IPC ORIGINAL: B01J0008-02 [I,A]; B01J0008-02 [I,C]; F28D0009-00 [I,A]; F28D0009-00 [I,C]
ECLA: B01J0008-02B2; B01J0008-02H; F28D0009-00B; F28D0009-00K; F28F0027-02B
ICO: L01J0208:00C2D2F
BASIC ABSTRACT:
EP 2090355 A1 UPAB: 20090902

NOVELTY - The chemical isothermal reactor comprises a plate heat exchanger (10) with an annular structure. The heat exchanger comprises heat-exchange radial plates (11) having internal passages for an heat exchange fluid, and radial ducts (14, 15) in fluid communication with the internal passages and aligned with a radial side of the plate. The radial ducts have diverging ends (14d, 15d) lying on an external diameter of the annular structure and opposite converging ends (14c, 15c) lying on an internal diameter of the structure, and are fixed to corresponding sides of the plates.

DETAILED DESCRIPTION - The chemical isothermal reactor comprises a plate heat exchanger (10) with an annular structure. The heat exchanger comprises heat-exchange radial plates (11) having internal passages for an heat exchange fluid, and radial ducts (14, 15) in fluid communication with the internal passages and aligned with a radial side of the plate. The radial ducts have diverging ends (14d, 15d) lying on an external diameter of the annular structure and opposite converging ends (14c, 15c) lying on an internal diameter of the structure, and are fixed to corresponding sides of the plates. The converging ends of the radial ducts have a reduced cross section compared to the respective diverging ends. A portion of each radial duct is a tapered portion having a cross-section continuously decreasing up to the converging end of the duct. The portion of each radial duct is conical or frusto-conical. The cone angle of each radial duct portion is less than 10 degrees . Each of the radial ducts of the heat exchanger has an outer cylindrical portion with a first diameter, and an inner cylindrical portion near the converging end of the duct. The inner cylindrical portion has a diameter smaller than diameter of the outer cylindrical portion. The plates have a structure comprising: first and second walls; and internal spacer elements for connecting the first flat wall to the second flat wall, with the obtainment of channels for the heat exchange fluid, between the first and second walls. The radial ducts have openings in fluid communication with the parallel channels formed in the plates for the heat exchange fluid. An INDEPENDENT CLAIM is included for a plate heat exchanger (10) for use in an isothermal chemical reactor.

USE - The chemical isothermal reactor is useful in methanol synthesis plants for exothermic or endothermic heterogeneous reactions.

ADVANTAGE - The chemical isothermal reactor maintains temperature of the reaction in a range of optimal efficiency and a suitable spacing between the pipe ends, and avoids mechanical interference between internal ends of radial heat exchange fluid feeding or collecting ducts of radial heat exchange plates thus providing simple and cost-effective construction of the reactors and improving the efficiency of the isothermal chemical reaction .

DESCRIPTION OF DRAWINGS - The diagram shows a schematic view of a partially cut-out view of an isothermal chemical reactor.

Plate heat exchanger (10)
Heat-exchange radial plates (11)
Radial ducts (14, 15)
Converging ends of the ducts (14c, 15c)

Diverging ends of the ducts. (14d, 15d)

FILE SEGMENT: CPI; GMPI; EPI
MANUAL CODE: CPI: E10-E04E1; J04-X03
EPI: X25-L07

L51 ANSWER 2 OF 13 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 2009-J75032 [37] WPIX
TITLE: Isothermal chemical reactor including isothermal or pseudo-isothermal catalytic reactor for exothermic or endothermic heterogeneous reactions, comprises internal plate heat exchange unit and internal spacer elements
DERWENT CLASS: J04; Q78; X25
INVENTOR: FILIPPI E; RIZZI E; TAROZZO M
PATENT ASSIGNEE: (METH-N) METHANOL CASALE SA
COUNTRY COUNT: 123

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
EP 2062640	A1	20090527	(200937)*	EN	14[5]	
WO 2009068158	A1	20090604	(200937)	EN		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
EP 2062640 A1		EP 2007-22863	20071126
WO 2009068158 A1		WO 2008-EP9339	20081106

PRIORITY APPLN. INFO: EP 2007-22863 20071126
INT. PATENT CLASSIF.:
IPC ORIGINAL: B01J0019-00 [I,A]; B01J0019-00 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; F28D0009-00 [I,A]; F28D0009-00 [I,C]
ECLA: B01J0008-02B2; B01J0008-02H; B01J0019-00B2; F28D0009-00B; F28D0009-00K
ICO: L01J0208:00C2D2F; L01J0219:00B2D2F
BASIC ABSTRACT:

EP 2062640 A1 UPAB: 20090615

NOVELTY - An isothermal chemical reactor (1) comprises internal plate heat exchange unit(s) (12) for providing heat exchange between fluid inside the unit flowing through the plates (30) and fluid outside the unit and contained in reactor; and internal spacer elements connecting the first flat wall to second flat wall, with obtainment of parallel channels defined between walls for passage of internal fluid. Each of plates of heat exchange unit comprises two-dimensional first and second flat walls. The walls are parallel to and spaced from each other.

USE - An isothermal chemical reactor including isothermal or pseudo-isothermal catalytic reactor for exothermic or endothermic heterogeneous reactions.

ADVANTAGE - The mechanical strength of plates is very high, and can be virtually increased as desired. The plates can withstand very high pressure differences between inside and outside. The head losses of plate configuration are lower than that of swelled plates. The external surface of plates

contacting the external fluid can be perfectly smooth to facilitate discharge of catalyst and prevent corrosion. The plate type exchangers in isothermal reactors has high exchange surface, low cost and easy installation.

DESCRIPTION OF DRAWINGS - The drawing shows a schematic sectional view of a plate type isothermal chemical reactor.

Isothermal chemical reactor (1)
Cylindrical shell (2)
Catalytic bed (7)
Heat exchange unit (12)
Plates (30)

FILE SEGMENT: CPI; GMPI; EPI
MANUAL CODE: CPI: J04-E06; J04-E08; J04-X; N06-D
EPI: X25-L07

L51 ANSWER 3 OF 13 WPIX
ACCESSION NUMBER: 2008-F85053 [37] WPIX
CROSS REFERENCE: 2008-F64408
TITLE: Isothermal reactor useful for carrying out exothermal and endothermal chemical reactions, comprises pressure vessel, reaction zone, catalytic basket, and heat exchanger unit(s)
DERWENT CLASS: J04; S02
INVENTOR: FILIPPI E; RIZZI E; TAROZZO M
PATENT ASSIGNEE: (METH-N) METHANOL CASALE SA
COUNTRY COUNT: 119

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
WO 2007131610	A1	20071122	(200837)*	EN	23[2]	
EP 2021119	A1	20090211	(200917)	EN		
US 20090145589	A1	20090611	(200939)	EN		
CN 101443107	A	20090527	(200941)	ZH		
AU 2007250294	A1	20071122	(200943)	EN		
IN 2008CN05801	P4	20090327	(200951)	EN		
CA 2648873	A1	20071122	(200955)	EN		
MX 2009003935	A1	20090430	(200970)	ES		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 2007131610	A1	WO 2007-EP3757	20070427
AU 2007250294	A1	AU 2007-250294	20070427
CA 2648873	A1	CA 2007-2648873	20070427
CN 101443107	A	CN 2007-80017172	20070427
EP 2021119	A1	EP 2007-724684	20070427
EP 2021119	A1 PCT Application	WO 2007-EP3757	20070427
US 20090145589	A1 PCT Application	WO 2007-EP3757	20070427
CN 101443107	A PCT Application	WO 2007-EP3757	20070427
IN 2008CN05801	P4 PCT Application	WO 2007-EP3757	20070427
CA 2648873	A1 PCT Application	WO 2007-EP3757	20070427
CA 2648873	A1 PCT Nat. Entry	CA 2007-2648873	20081009
IN 2008CN05801	P4	IN 2008-CN5801	20081028
US 20090145589	A1	US 2008-300446	20081216
MX 2009003935	A1 PCT Application	WO 2007-EP3757	20070427
MX 2009003935	A1	MX 2009-3935	20090414

FILING DETAILS:

PATENT NO	KIND		PATENT NO	
EP 2021119	A1	Based on	WO 2007131610	A
CN 101443107	A	Based on	WO 2007131610	A
AU 2007250294	A1	Based on	WO 2007131610	A
CA 2648873	A1	Based on	WO 2007131610	A
MX 2009003935	A1	Based on	WO 2007131610	A

PRIORITY APPLN. INFO: EP 2006-9888 20060512
INT. PATENT CLASSIF.:
MAIN: B01J0008-02
IPC ORIGINAL: B01J0008-02 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; F28D0021-00 [I,A]; F28D0021-00 [I,C]; G01M0003-20 [I,C]; G01M0003-20 [I,C]; G01M0003-20 [I,C]; G01M0003-22 [I,A]; G01M0003-22 [I,A]
ECLA: B01J0008-02B2; B01J0008-02H; F28D0009-00B; F28D0009-00F; F28F0009-02S; G01M0003-22G4
ICO: L01J0208:00C2D2F; L01J0219:00B40N
USCLASS NCLM: 165/157.000
BASIC ABSTRACT:

WO 2007131610 A1 UPAB: 20080615

NOVELTY - Isothermal reactor (1) comprises pressure vessel (2), reaction zone (9), catalytic basket (10), and heat exchanger unit(s) (13). The pressure vessel is closed at the opposite ends by respective bottoms (3, 4). The reaction zone is in pressure vessel in which catalytic basket (10) is positioned. The heat exchange unit is embedded in catalytic basket. Each heat exchange unit comprises heat exchangers (14).

DETAILED DESCRIPTION - Isothermal reactor comprises a pressure vessel, reaction zone, catalytic basket, heat exchanger unit(s). The pressure vessel is closed at the opposite ends by respective bottoms. The reaction zone is in pressure vessel in which catalytic basket is positioned. The heat exchange unit is embedded in catalytic basket. Each heat exchange unit comprises heat exchangers. Each heat exchanger has inner chamber. The inner chamber is intended to be crossed by an operating heat exchange fluid. The reactor comprises picking units (17, 18). The picking units pick up samples of operating heat exchange fluid from groups of pre-established exchangers in each heat exchange unit to ascertain the possible existence of damaged exchangers in groups of exchangers through analysis of respective samples of operating heat exchange fluid. The samples of operating heat exchange fluid are picked up through pick-up units at the outlet of the operating heat exchange fluid from the exchangers of the respective groups of exchangers. The pick-up units comprise collector duct, and pick-up duct. The pick-up ducts of the groups of exchangers are grouped in bundles at an end portion. Each bundle of ducts crosses a bottom or the pressure vessel of the reactor so as to place the respective pick-up ducts in fluid communication with the outside of the reactor. An INDEPENDENT CLAIM is included for detecting the existence of damaged heat exchangers in group of heat exchangers of an isothermal reactor.

USE - The isothermal reactor is useful for carrying out exothermal and endothermal chemical reactions under isothermal conditions.

ADVANTAGE - The reactor is capable of detecting possible presence of damaged heat exchange plates in simple and cost effective manner to reduce the shut-down and maintenance times of the reactor in the case where it is necessary to replace or repair damaged plates.

DESCRIPTION OF DRAWINGS - The figure shows perspective partial section view of the radial isothermal reactor.

```
            Isothermal reactor (1)
          Pressure vessel (2)
          Bottoms (3, 4)
            Reaction zone (9)
          Catalytic basket (10)
            Heat exchanger unit (13)
            Heat exchangers (14)
          Picking units (17, 18)
FILE SEGMENT:          CPI; EPI
MANUAL CODE:           CPI: J04-E06; J04-E08; N06-C08
                       EPI: S02-J06A

L51  ANSWER 4 OF 13  WPIX COPYRIGHT 2010       THOMSON REUTERS on STN
ACCESSION NUMBER:      2008-F64408 [37]   WPIX
CROSS REFERENCE:       2008-F85053
TITLE:                 Isothermal reactor for carrying
                       out exothermal and endothermal chemical
                       reactions, comprises a pressure vessel closed
                       at the opposite ends by respective bottoms, a
                       reaction zone in the pressure vessel, and a
                       heat exchange unit
DERWENT CLASS:         J04; S02
INVENTOR:              FILIPPI E; RIZZI E; TAROZZO
                       M
PATENT ASSIGNEE:       (METH-N) METHANOL CASALE SA
COUNTRY COUNT:         36

PATENT INFORMATION:

      PATENT NO      KIND DATE     WEEK     LA  PG          MAIN IPC
      -----------------------------------------------------------------
      EP 1854534      A1 20071114 (200837)* EN  10[2]

APPLICATION DETAILS:

      PATENT NO      KIND                  APPLICATION    DATE
      -----------------------------------------------------------------
      EP 1854534 A1                        EP 2006-9888 20060512

PRIORITY APPLN. INFO: EP 2006-9888         20060512
INT. PATENT CLASSIF.:
   IPC ORIGINAL:      B01J0008-02 [I,A]; B01J0008-02
                      [I,C]; G01M0003-20 [I,C]; G01M0003-22 [I,A]
ECLA:                 B01J0008-02B2; B01J0008-02H; F28D0009-00B;
                      F28D0009-00F; F28F0009-02S; G01M0003-22G4
ICO:                  L01J0208:00C2D2F; L01J0219:00B40N
BASIC ABSTRACT:
           EP 1854534 A1    UPAB: 20080615
```

NOVELTY - The isothermal reactor (1) for carrying out exothermal and endothermal chemical reactions, comprises a pressure vessel (2) closed at the opposite ends by respective bottoms (3, 4), a reaction zone (9) in the pressure vessel in which a catalytic basket (10) is positioned, and a heat exchange unit embedded in the catalytic basket. Each heat exchange unit (13) comprises heat exchangers (14) each having an inner chamber intended to be crossed by an operating heat exchange fluid. The reactor comprises unit for picking up samples of operating heat exchange fluid.

DETAILED DESCRIPTION - The isothermal reactor (1) for carrying out exothermal and endothermal chemical reactions, comprises a pressure vessel (2) closed at the opposite ends by respective bottoms (3, 4), a reaction zone (9) in the pressure vessel in which a catalytic basket (10) is positioned, and a

heat exchange unit embedded in the catalytic basket. Each heat exchange unit (13) comprises heat exchangers (14) each having an inner chamber intended to be crossed by an operating heat exchange fluid. The reactor comprises unit for picking up samples of operating heat exchange fluid from groups (16) of pre-established exchangers in each heat exchange unit so as to ascertain the possible existence of damaged exchangers in the groups of exchangers through analysis of respective samples of operating heat exchange fluid. The samples are picked up through the pick-up unit at the outlet of the operating heat exchange fluid from the exchangers. The pick-up unit comprises a collector duct (17) of operating heat exchange fluid in fluid communication with each exchanger of the group of exchangers, and a pick-up duct (18) of heat exchange fluid in fluid communication with the collector duct and with the outside of the reactor. The pick-up ducts are grouped in bundles (40) at an end portion. Each bundle of ducts crosses a bottom or the pressure vessel of the reactor so as to place the respective pick-up ducts in fluid communication with the outside of the reactor . Each of the heat exchangers have a flat, plate-shaped structure with essentially elongated rectangular configuration with long sides (14a) parallel to the axis of the pressure vessel and short sides (14b, 14c) extending radially with respect to heat exchangers. Each collector duct is situated at a height close to that of the upper short sides of the exchangers and each pick-up duct extends at the top from the respective collector duct to be placed in direct or indirect fluid communication with the outside of the reactor. The pick-up ducts of each bundle are engaged with the upper bottom of the reactor through a respective mouth (21). An INDEPENDENT CLAIM is included for a method of detecting the existence of damaged heat exchangers in an isothermal reactor.

USE - Useful for carrying out exothermal and endothermal chemical reactions conducted in isothermal conditions.

ADVANTAGE - The isothermal reactor is capable of detecting the possible presence of damaged heat exchange plates in a simple and a cost-effective manner thus reducing the shut-down and maintenance times of the reactor in the case in which it is necessary to replace or repair damaged plates.

DESCRIPTION OF DRAWINGS - The figure shows a radial isothermal reactor.

Isothermal reactor (1)
Pressure vessel (2)
Bottoms (3, 4)
Reaction zone (9)
Catalytic basket (10)
Heat exchange unit (13)
Heat exchangers. (14)

FILE SEGMENT: CPI; EPI
MANUAL CODE: CPI: J04-E06; J04-E08; N06-D; N07-A
EPI: S02-J06A

L51 ANSWER 5 OF 13 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 2008-E09663 [29] WPIX
TITLE: Isothermal reactor for carrying out exothermal and endothermal heterogeneous reactions has heat exchangers arranged in parallel to each other and parallel to direction in which catalytic bed is crossed by gaseous flow of reactants
DERWENT CLASS: J04
INVENTOR: FILIPPI E; RIZZI E; TAROZZO M
PATENT ASSIGNEE: (METH-N) METHANOL CASALE SA
COUNTRY COUNT: 122

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
EP 1900424	A1	20080319	(200829)*	EN	10[3]	
WO 2008031488	A1	20080320	(200829)	EN		
EP 2066435	A1	20090610	(200938)	EN		
AU 2007296992	A1	20080320	(200952)	EN		
CN 101511463	A	20090819	(200957)	ZH		
CA 2670069	A1	20080320	(200963)	EN		
MX 2009002636	A1	20090331	(200966)	ES		
EP 2066435	B1	20091216	(200982)	EN		
DE 602007003855	E	20100128	(201008)	DE		

APPLICATION DETAILS:

PATENT NO KIND	APPLICATION DATE
EP 1900424 A1	EP 2006-18961 20060911
AU 2007296992 A1	AU 2007-296992 20070820
CA 2670069 A1	CA 2007-2670069 20070820
CN 101511463 A	CN 2007-80033648 20070820
EP 2066435 A1	EP 2007-801776 20070820
EP 2066435 B1	EP 2007-801776 20070820
WO 2008031488 A1	WO 2007-EP7336 20070820
EP 2066435 A1 PCT Application	WO 2007-EP7336 20070820
CN 101511463 A PCT Application	WO 2007-EP7336 20070820
CA 2670069 A1 PCT Application	WO 2007-EP7336 20070820
MX 2009002636 A1 PCT Application	WO 2007-EP7336 20070820
EP 2066435 B1 PCT Application	WO 2007-EP7336 20070820
CA 2670069 A1 PCT Nat. Entry	CA 2007-2670069 20090305
MX 2009002636 A1	MX 2009-2636 20090310
DE 602007003855 E	DE 2007-602007003855 20070820
DE 602007003855 E	EP 2007-801776 20070820
DE 602007003855 E PCT Application	WO 2007-EP7336 20070820

FILING DETAILS:

PATENT NO	KIND		PATENT NO	
EP 2066435	A1	Based on	WO 2008031488	A
AU 2007296992	A1	Based on	WO 2008031488	A
CN 101511463	A	Based on	WO 2008031488	A
CA 2670069	A1	Based on	WO 2008031488	A
MX 2009002636	A1	Based on	WO 2008031488	A
EP 2066435	B1	Based on	WO 2008031488	A
DE 602007003855	E	Based on	EP 2066435	A
DE 602007003855	E	Based on	WO 2008031488	A

PRIORITY APPLN. INFO: EP 2006-18961 20060911

INT. PATENT CLASSIF.:

IPC ORIGINAL: B01J0008-02 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]

ECLA: B01J0008-02B4; B01J0008-02H; B01J0008-04H; B01J0019-24R4; F28D0007-00H; F28D0009-00

ICO: L01J0208:00C2D2; L01J0208:00C2D2B; L01J0208:00C2D2C; L01J0208:00C2D2F; L01J0208:02A2; L01J0219:24R4B10B; L01J0219:24R4B2; L01J0219:24R4D2; L01J0219:24R4F2;

L01J0219:24R4P2D; L01J0219:24R4P4B

BASIC ABSTRACT:

EP 1900424 A1 UPAB: 20080504

NOVELTY - A catalytic bed (6) extending in an outer shell (2), has opposite perforated side walls (7,8) respectively for inlet of gaseous flow of reactants and for outlet of gaseous flow comprising reaction products. A heat exchange unit (12) immersed in the catalytic bed, has succession of heat exchangers (13) arranged in parallel to each other and parallel to the direction in which the catalytic bed is crossed by the gaseous flow of reactants.

USE - Isothermal reactor for carrying out exothermal and endothermal heterogeneous reactions.

ADVANTAGE - The heat exchange between gaseous flow and the heat exchange fluid is optimized while simplifying the reactor structure. High heat exchange coefficient is provided effectively. The yield is improved while reducing the energy consumption.

DESCRIPTION OF DRAWINGS - The drawing shows schematic longitudinal sectional view of the isothermal reactor.

Outer shell (2)
Catalytic bed (6)
Side walls of catalytic bed (7,8)
Heat exchange unit (12)
Heat exchanger (13)

FILE SEGMENT: CPI
MANUAL CODE: CPI: J04-E07; N06-D

L51 ANSWER 6 OF 13 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 2008-C76457 [20] WPIX
TITLE: Isothermal reactor for carrying out chemical reactions in isothermal conditions comprises fins between adjacent heat exchangers for deviating flow of reacting gases crossing catalytic bed towards adjacent heat exchangers
DERWENT CLASS: J04
INVENTOR: CLAYTON K A; COMANDINI E
PATENT ASSIGNEE: (METH-N) METHANOL CASALE SA
COUNTRY COUNT: 122

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
WO 2008022744	A1	20080228	(200820)*	EN	36[9]	
EP 1892036	A1	20080227	(200820)	EN		
EP 2061586	A1	20090527	(200935)	EN		
AU 2007287792	A1	20080228	(200952)	EN		
CN 101505864	A	20090812	(200956)	ZH		
IN 2009CN01560	P4	20090821	(200962)	EN		
MX 2009001859	A1	20090331	(200966)	ES		
CA 2661174	A1	20080228	(200980)	EN		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 2008022744	A1	WO 2007-EP7254	20070816
EP 1892036	A1	EP 2006-17358	20060821
AU 2007287792	A1	AU 2007-287792	20070816

CN 101505864 A	CN 2007-80031030 20070816
EP 2061586 A1	EP 2007-801708 20070816
EP 2061586 A1 PCT Application	WO 2007-EP7254 20070816
CN 101505864 A PCT Application	WO 2007-EP7254 20070816
IN 2009CN01560 P4 PCT Application	WO 2007-EP7254 20070816
MX 2009001859 A1 PCT Application	WO 2007-EP7254 20070816
MX 2009001859 A1	MX 2009-1859 20090219
IN 2009CN01560 P4	IN 2009-CN1560 20090319
CA 2661174 A1	CA 2007-2661174 20070816
CA 2661174 A1 PCT Application	WO 2007-EP7254 20070816
CA 2661174 A1 PCT Nat. Entry	CA 2007-2661174 20090219

FILING DETAILS:

PATENT NO	KIND		PATENT NO	
EP 2061586	A1	Based on	WO 2008022744	A
AU 2007287792	A1	Based on	WO 2008022744	A
CN 101505864	A	Based on	WO 2008022744	A
MX 2009001859	A1	Based on	WO 2008022744	A
CA 2661174	A1	Based on	WO 2008022744	A

PRIORITY APPLN. INFO: EP 2006-17358 20060821
INT. PATENT CLASSIF.:
MAIN: B01J0008-02
IPC ORIGINAL: B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-02 [I,C]
ECLA: B01J0008-02B2; B01J0008-02H; B01J0019-24R4; F28D0009-00B; F28D0009-00F; F28F0003-02; F28F0009-22; F28F0013-06
ICO: L01J0208:00C2D2F; L01J0208:00L4B2; L01J0208:02A2; L01J0219:24R4B10B; L01J0219:24R4B10D; L01J0219:24R4B6; L01J0219:24R4D2; L01J0219:24R4H; L01J0219:24R4P2D; L01J0219:24R4P4B; L01J0219:24R4P4B2

BASIC ABSTRACT:
WO 2008022744 A1 UPAB: 20080324

NOVELTY - An isothermal reactor comprises cylindrical shell, catalytic bed (10) supported in the shell intended for being crossed by a flow of reacting gases, and thermal exchange unit comprising heat exchangers (14). A reactor zone (36) of catalytic bed has fins (18) between adjacent heat exchangers for deviating the flow of reacting gases crossing the catalytic bed towards the adjacent heat exchangers. The fins have plate-like structure and rectangular shape. The fins are arranged inclined relative to the walls (15, 16) of the respective heat exchangers.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is included for a thermal exchange unit for an isothermal reactor.

USE - Isothermal reactors for carrying out exothermic or endothermic chemical reactions in isothermal conditions.

ADVANTAGE - The reactor achieves optimum thermal exchange efficiency between heat exchangers and catalytic bed even in low conductivity conditions of the catalytic bed.

DESCRIPTION OF DRAWINGS - The drawing shows a cross-sectional view of the isothermal reactor.

Catalytic bed (10)
Heat exchangers (14)
Walls (15, 16)
Fins (18)
Reactor zone (36)

FILE SEGMENT: CPI
MANUAL CODE: CPI: J04-E06; N06-C05; N06-C06;

N06-D

L51 ANSWER 7 OF 13 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 2007-863738 [80] WPIX
CROSS REFERENCE: 2002-012612; 2007-224999
DOC. NO. NON-CPI: N2007-686799 [80]
TITLE: Isothermal reactor for carrying out exothermic/endothermic heterogeneous reactions, comprises outer shell of cylindrical shape, plate heat exchanger embedded in catalytic layer supported into shell, and anchoring unit of the exchangers
DERWENT CLASS: Q78
INVENTOR: FILIPPI E; RIZZI E; TAROZZO M
PATENT ASSIGNEE: (METH-N) METHANOL CASALE SA
COUNTRY COUNT: 20

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
EP 1854535	A2	20071114	(200780)*	EN	14[6]	
EP 1854535	A3	20080220	(200816)	EN		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
EP 1854535	A2 Div Ex	EP 2001-943305	20010510
EP 1854535	A2	EP 2007-9542	20010510

FILING DETAILS:

PATENT NO	KIND		PATENT NO	
EP 1854535	A2	Div ex	EP 1284813	A

PRIORITY APPLN. INFO: EP 2000-109968 20000511
INT. PATENT CLASSIF.:
IPC ORIGINAL: B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-04 [I,A]; B01J0008-04 [I,C]; F28D0009-00 [I,A]; F28D0009-00 [I,C]
IPC RECLASSIF.: B01J0019-24 [I,A]; B01J0019-24 [I,C]; F28F0009-26 [I,A]; F28F0009-26 [I,C]
ECLA: B01J0008-02B2; B01J0008-02D2; B01J0008-02H; B01J0008-04D2D; B01J0008-04H; B01J0019-24R4; F28D0009-00B; F28D0009-00E; F28D0009-00P; F28F0009-02S6C; F28F0009-26
ICO: L01J0208:00C2D2F; L01J0208:02A2; L01J0208:02D2B; L01J0219:00A4C; L01J0219:24R4B10B; L01J0219:24R4B2; L01J0219:24R4B6; L01J0219:24R4D2; L01J0219:24R4P2D; L01J0219:24R4P4B; L01J0219:24R4R2B; L01J0219:24R4R2B2
BASIC ABSTRACT:
EP 1854535 A2 UPAB: 20071217
NOVELTY - The isothermal reactor (1) for carrying out exothermic or endothermic heterogeneous reactions, comprises an outer shell (2) of cylindrical shape, a plate heat exchanger (9) embedded in a catalytic layer

(10) supported into the shell, and an anchoring unit (18, 91) of the exchangers. The plates (14) of the exchanger comprise ducts (14a) extending parallel and perpendicular to the axis of the shell, and respective mutually juxtaposed walls (14', 14'') that define between them the ducts. The shell supports the heat exchangers in fluid communication with a feed duct (6).

DETAILED DESCRIPTION - The isothermal reactor (1) for carrying out exothermic or endothermic heterogeneous reactions, comprises an outer shell (2) of cylindrical shape, a plate heat exchanger (9) embedded in a catalytic layer (10) supported into the shell, and an anchoring unit (18, 91) of the exchangers. The plates (14) of the exchanger comprise ducts (14a) extending parallel and perpendicular to the axis of the shell, and respective mutually juxtaposed walls (14', 14'') that define between them the ducts. The shell supports the heat exchangers in fluid communication with a feed duct (6) of a heat exchange fluid. The heat exchangers are arranged radially in the catalytic layer. An INDEPENDENT CLAIM is included for a method of the manufacture of a reactor.

USE - The isothermal reactor is useful for carrying out exothermic or endothermic heterogeneous reactions (claimed).

ADVANTAGE - The isothermal reactor has high capacity, requires low investment and maintenance costs, and simple construction and is reliable to operate with a high conversion yield, low pressure drops, low energy consumption and high heat exchange efficiency between the reactants and the heat exchange fluid.

DESCRIPTION OF DRAWINGS - The figure shows the isothermal reactor.

Isothermal reactor (1)
Outer shell (2)
Feed duct (6)
Heat exchanger (9)
Catalytic layer (10)
Plates (14)
Ducts (14a)
Juxtaposed walls (14', 14'')
Anchoring unit. (18, 91)

FILE SEGMENT: GMPI

L51 ANSWER 8 OF 13 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN

ACCESSION NUMBER: 2006-020473 [02] WPIX
DOC. NO. CPI: C2006-006152 [02]
TITLE: Carrying out a synthesis gas reaction comprises separating product-containing condensate from a split stream of product gases
DERWENT CLASS: E36; J04
INVENTOR: HIPP A J; HIPP A
PATENT ASSIGNEE: (HIPP-N) HIPPWEB EK; (AMMO-N) AMMONIA CASALE SA
COUNTRY COUNT: 110

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
WO 2005115607	A1	20051208	(200602)*	DE	40[6]	
DE 102004028200	B3	20051215	(200602)	DE		
EP 1773483	A1	20070418	(200729)	DE		
AU 2005247609	A1	20051208	(200731)	EN		
CN 1972743	A	20070530	(200763)	ZH		
US 20070293590	A1	20071220	(200802)	EN		
IN 2006CN04786	P4	20071005	(200807)	EN		
BR 2005011587	A	20080102	(200808)	PT		
EP 1773483	B1	20080206	(200812)	DE		

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DE 502005002766 G  20080320 (200822)  DE
MX 2006013857   A1 20070501 (200841)  ES
MX 265520       B  20090331 (200968)  ES
CN 100518920    C  20090729 (201001)  ZH
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APPLICATION DETAILS:

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PATENT NO      KIND                    APPLICATION    DATE
------------------------------------------------------------------
WO 2005115607 A1                       WO 2005-EP5775 20050528
DE 102004028200 B3                     DE 2004-102004028200 20040528
AU 2005247609 A1                       AU 2005-247609 20050528
BR 2005011587 A                        BR 2005-11587 20050528
CN 1972743 A                           CN 2005-80017412 20050528
DE 502005002766 G                      DE 2005-502005002766 20050528
EP 1773483 A1                          EP 2005-753654 20050528
EP 1773483 B1                          EP 2005-753654 20050528
DE 502005002766 G                      EP 2005-753654 20050528
EP 1773483 A1                          WO 2005-EP5775 20050528
US 20070293590 A1                      WO 2005-EP5775 20050528
IN 2006CN04786 P4                      WO 2005-EP5775 20050528
BR 2005011587 A                        WO 2005-EP5775 20050528
EP 1773483 B1                          WO 2005-EP5775 20050528
DE 502005002766 G                      WO 2005-EP5775 20050528
MX 2006013857 A1                       WO 2005-EP5775 20050528
MX 265520 B PCT Application            WO 2005-EP5775 20050528
MX 2006013857 A1                       MX 2006-13857 20061128
MX 265520 B                            MX 2006-13857 20061128
IN 2006CN04786 P4                      IN 2006-CN4786 20061228
US 20070293590 A1                      US 2007-569726 20070904
CN 100518920 C                         CN 2005-80017412 20050528
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FILING DETAILS:

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PATENT NO       KIND                    PATENT NO
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DE 502005002766 G     Based on          EP 1773483      A
EP 1773483      A1    Based on          WO 2005115607   A
AU 2005247609   A1    Based on          WO 2005115607   A
BR 2005011587   A     Based on          WO 2005115607   A
EP 1773483      B1    Based on          WO 2005115607   A
DE 502005002766 G     Based on          WO 2005115607   A
MX 2006013857   A1    Based on          WO 2005115607   A
MX 265520       B     Based on          WO 2005115607   A
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PRIORITY APPLN. INFO: DE 2004-102004028200 20040528
INT. PATENT CLASSIF.:
           MAIN:      C07C0029-151; C07C0031-04
   IPC ORIGINAL:      B01J0008-04 [I,A]; B01J0008-06
                      [I,A]; B01J0008-08 [I,C];
                      B01J0008-08 [I,A]; B01J0008-08
                      [I,A]; B01J0008-08 [I,C];
                      B01J0008-08 [I,A]; B01J0008-08
                      [I,C]; C01C0001-00 [I,C]; C01C0001-00 [I,C];
                      C01C0001-00 [I,C]; C01C0001-04 [I,A]; C01C0001-04
                      [I,A]; C01C0001-04 [I,A]; C07C0027-00 [I,A];
                      C07C0027-00 [I,C]; C07C0029-00 [I,C]; C07C0029-00
                      [I,C]; C07C0029-00 [I,C]; C07C0029-151 [I,A];
                      C07C0029-151 [I,A]
  IPC RECLASSIF.:     B01J0008-02 [I,C]; B01J0008-04
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[I,A]; B01J0008-04 [I,C];
B01J0008-06 [I,A]; C01C0001-00 [I,C];
C01C0001-04 [I,A]; C07C0029-00 [I,C]; C07C0029-151
[I,A]

ECLA: B01J0008-04H; B01J0008-06H; C01C0001-04B6D; C07C0029-151B

ICO: L01J0208:00C2D2C; L01J0208:00C2D2D; L01J0208:00C2D4C; L01J0208:00C2D4L; L01J0208:00C2D6B; L01J0208:00C2D6D; L01J0208:00C2Z; L01J0219:00A2B; L01J0219:00A4C; L01J0219:00A6L

USCLASS NCLM: 518/713.000

BASIC ABSTRACT:

WO 2005115607 A1 UPAB: 20060125

NOVELTY - Carrying out a heterogeneous-catalytic exothermic gas-phase reaction in which synthesis gas is passed through at least two synthesis stages in series comprises splitting the product gases from each stage other than the last into two streams, cooling one stream until the product condenses out, separating the condensate from the gaseous components and combining the gaseous components with the other stream to attain the inlet temperature of the next synthesis stage.

DETAILED DESCRIPTION - Carrying out a heterogeneous-catalytic exothermic gas-phase reaction at elevated temperature and pressure, in which a mixture of fresh and/or recycled synthesis gas is passed through at least two synthesis stages in series, comprises splitting the product gases from each stage other than the last into two streams, cooling one stream (stream 1) until the product condenses out, separating the condensate from the gaseous components and combining the gaseous components with the other stream (stream 2) to attain the inlet temperature of the next synthesis stage.

USE - Carrying out a heterogeneous-catalytic exothermic gas-phase reaction, especially methanol or ammonia synthesis.

ADVANTAGE - Computer models for a two-stage ammonia synthesis system indicate that the production capacity can be increased by almost 50%.

TECHNOLOGY FOCUS:

CHEMICAL ENGINEERING - Preferred Process: After separating the condensate, stream 1 is heated to a temperature below that of stream 2 before mixing with stream 2. Heat removed from stream 1 during cooling is used to heat stream 1 after condensate separation. Most of the heat removed on cooling stream 1 is recovered by indirect heat exchange with boiler feed water and/or desalinated water. The synthesis gas entering the first synthesis stage comprises 16-40 mole% fresh synthesis gas. The last reactor is cooled by indirect heat exchange with synthesis gas. The synthesis gas comprises hydrogen, carbon monoxide and carbon dioxide and is contacted with a granular copper-containing catalyst at 200-350degreesC and 20-120 bar to produce methanol, and 15-50% of the total methanol production is separated as condensate between the first and last stages and the first reactor is an adiabatic multibed reactor, a tubular reactor cooled with synthesis gas or an isothermal reactor in which water boiling under high pressure is passed as coolant through tubes running through the catalyst. At least three ammonia reactors are connected in series and each reactor has a downstream waste heat boiler to convert part of the heat of reaction into steam and stream 1 after ammonia condensation is heated with heat from a downstream reactor.

FILE SEGMENT: CPI

MANUAL CODE: CPI: E10-E04E1; E32-A01; J04-E01; N02-D01

L51 ANSWER 9 OF 13 WPIX

ACCESSION NUMBER: 2004-349356 [33] WPIX
DOC. NO. CPI: C2004-132912 [33]
TITLE: Highly exothermic oxidizing reactions in pseudo-isothermal conditions, e.g. for producing nitric acid, involves feeding part of continuous flow of reactants at different points of catalytic bed
DERWENT CLASS: J04
INVENTOR: CLAYTON K A; FILIPPI E; JAROZZO M; RIZZI E; TAROZZO M; CLAYTON K
PATENT ASSIGNEE: (AMMO-N) AMMONIA CASALE SA; (FILI-I) FILIPPI E; (JARO-I) JAROZZO M; (RIZZ-I) RIZZI E
COUNTRY COUNT: 105

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
EP 1410842	A1	20040421	(200433)*	EN	8[2]	
WO 2004035198	A1	20040429	(200433)	EN		
AU 2003273834	A1	20040504	(200467)	EN		
EP 1551544	A1	20050713	(200546)	EN		
BR 2003015333	A	20050816	(200557)	PT		
CN 1688385	A	20051026	(200618)	ZH		
MX 2005004010	A1	20050701	(200628)	ES		
US 20060140844	A1	20060629	(200643)	EN		
EP 1551544	B1	20071114	(200777)	EN		
IN 2005CN00924	P4	20070824	(200780)	EN		
DE 60317545	E	20071227	(200803)	DE		
RU 2321456	C2	20080410	(200828)	RU		
CN 100344360	C	20071024	(200835)	ZH		
DE 60317545	T2	20080918	(200861)	DE		
MX 258160	B	20080624	(200940)	ES		
IN 220607	B	20080718	(200966)	EN		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
EP 1410842 A1		EP 2002-23316	20021017
AU 2003273834 A1		AU 2003-273834	20030908
BR 2003015333 A		BR 2003-15333	20030908
CN 1688385 A		CN 2003-824374	20030908
CN 100344360 C		CN 2003-824374	20030908
DE 60317545 E		DE 2003-60317545	20030908
DE 60317545 T2		DE 2003-60317545	20030908
EP 1551544 A1		EP 2003-757798	20030908
EP 1551544 B1		EP 2003-757798	20030908
DE 60317545 E		EP 2003-757798	20030908
DE 60317545 T2		EP 2003-757798	20030908
WO 2004035198 A1		WO 2003-EP9931	20030908
EP 1551544 A1	PCT Application	WO 2003-EP9931	20030908
BR 2003015333 A	PCT Application	WO 2003-EP9931	20030908
MX 2005004010 A1	PCT Application	WO 2003-EP9931	20030908
US 20060140844 A1	PCT Application	WO 2003-EP9931	20030908
EP 1551544 B1	PCT Application	WO 2003-EP9931	20030908
IN 2005CN00924 P4	PCT Application	WO 2003-EP9931	20030908
DE 60317545 E	PCT Application	WO 2003-EP9931	20030908

RU 2321456 C2 PCT Application	WO 2003-EP9931 20030908
DE 60317545 T2 PCT Application	WO 2003-EP9931 20030908
MX 258160 B PCT Application	WO 2003-EP9931 20030908
RU 2321456 C2	RU 2005-115066 20030908
MX 2005004010 A1	MX 2005-4010 20050415
MX 258160 B	MX 2005-4010 20050415
IN 2005CN00924 P4	IN 2005-CN924 20050513
US 20060140844 A1	US 2005-531189 20051006
IN 220607 B PCT Application	WO 2003-EP9931 20030908
IN 220607 B	IN 2005-CN924 20050513
IN 220607 B	IN 2005-CN924 20050513

FILING DETAILS:

PATENT NO	KIND		PATENT NO	
DE 60317545	E	Based on	EP 1551544	A
DE 60317545	T2	Based on	EP 1551544	A
AU 2003273834	A1	Based on	WO 2004035198	A
EP 1551544	A1	Based on	WO 2004035198	A
BR 2003015333	A	Based on	WO 2004035198	A
MX 2005004010	A1	Based on	WO 2004035198	A
EP 1551544	B1	Based on	WO 2004035198	A
DE 60317545	E	Based on	WO 2004035198	A
RU 2321456	C2	Based on	WO 2004035198	A
DE 60317545	T2	Based on	WO 2004035198	A
MX 258160	B	Based on	WO 2004035198	A

PRIORITY APPLN. INFO: EP 2002-23316 20021017
INT. PATENT CLASSIF.:
MAIN: B01J0008-02
IPC ORIGINAL: B01J0019-00 [I,A]; B01J0019-00 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; C01B0021-00 [I,C]; C01B0021-38 [I,A]; F28D0009-00 [I,A]; F28D0009-00 [I,C]
IPC RECLASSIF.: B01J0008-00 [I,A]; B01J0008-00 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; C07C0045-00 [I,C]; C07C0045-38 [I,A]; F28D0009-00 [I,A]; F28D0009-00 [I,C]
ECLA: B01J0008-00L; B01J0008-02D4; B01J0008-02H; C07C0045-38+47/04; F28D0009-00B; F28D0009-00F
ICO: L01J0208:00C18; L01J0208:00C2D2F; L01J0208:00C6
USCLASS NCLM: 423/392.000
BASIC ABSTRACT:
EP 1410842 A1 UPAB: 20060121

NOVELTY - Highly exothermic oxidizing reactions in pseudo-isothermal conditions involves feeding a part of reactants in continuous flow to a catalytic bed at different points of the catalytic bed corresponding to different successive stages of the reactions, at respective predetermined temperatures and flow rates. The catalytic bed has several heat exchangers (10), each of which is associated with at least one distribution-supplier (12) for continuous feeding.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is included for a reactor (1) including a shell (2) containing an apparatus immersed in a catalytic bed (L).

USE - For carrying out highly exothermic oxidizing reactions in pseudo-isothermal conditions (claimed) e.g. ammonia oxidation to form nitric acid, and methanol oxidation to form formaldehyde.

ADVANTAGE - The novel method controls both concentrations of the reactants and the reaction temperature around respective predetermined value; and promotes a longer lifetime of the catalyst.

DESCRIPTION OF DRAWINGS - The drawing shows the above reactor.

reactor (1)
shell (2)
heat exchanger (10)
distribution supplier (12)
catalyst bed (L)

FILE SEGMENT: CPI
MANUAL CODE: CPI: J04-E01; J04-E06; N06-D; N07-A

L51 ANSWER 10 OF 13 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 2003-383957 [37] WPIX
DOC. NO. CPI: C2003-102209 [37]
DOC. NO. NON-CPI: N2003-306711 [37]
TITLE: Heat exchange unit for isothermal radial or axial-radial chemical reactors includes rectangular, flattened box-shaped heat exchangers
DERWENT CLASS: J08; Q78
INVENTOR: FILIPPI E; FILLIPI E; RIZZI E; TAROZZO M
PATENT ASSIGNEE: (FILI-I) FILIPPI E; (METH-N) METHANOL CASALE SA; (RIZZ-I) RIZZI E; (TARO-I) TAROZZO M
COUNTRY COUNT: 100

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
EP 1306126	A1	20030502	(200337)*	EN	14[10]	
WO 2003035241	A1	20030501	(200339)	EN		
EP 1436075	A1	20040714	(200446)	EN		
AU 2002347040	A1	20030506	(200461)	EN		
BR 2002013343	A	20041026	(200479)	PT		
US 20050061490	A1	20050324	(200522)	EN		
CN 1571697	A	20050126	(200530)	ZH		
MX 2004003653	A1	20040901	(200553)	ES		
EP 1436075	B1	20050817	(200555)	EN		
DE 60205645	E	20050922	(200564)	DE		
IN 2004CN01083	P4	20060203	(200619)	EN		
DE 60205645	T2	20060608	(200638)	DE		
US 7055583	B2	20060606	(200638)	EN		
MX 239580	B	20060810	(200702)	ES		
RU 2298432	C2	20070510	(200752)	RU		
AU 2002347040	B2	20071220	(200813)	EN		
IN 229935	B	20090327	(201010)	EN		
CN 100577275	C	20100106	(201016)	ZH		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE

EP 1306126 A1	EP 2001-124956 20011019
IN 2004CN01083 P4	WO 2002-EP11024
AU 2002347040 A1	AU 2002-347040 20021002
AU 2002347040 B2	AU 2002-347040 20021002
BR 2002013343 A	BR 2002-13343 20021002
CN 1571697 A	CN 2002-820795 20021002
DE 60205645 E	DE 2002-60205645 20021002
DE 60205645 T2	DE 2002-60205645 20021002
EP 1436075 A1	EP 2002-782806 20021002
EP 1436075 B1	EP 2002-782806 20021002
DE 60205645 E	EP 2002-782806 20021002
DE 60205645 T2	EP 2002-782806 20021002
WO 2003035241 A1	WO 2002-EP11024 20021002
EP 1436075 A1	WO 2002-EP11024 20021002
BR 2002013343 A	WO 2002-EP11024 20021002
US 20050061490 A1	WO 2002-EP11024 20021002
MX 2004003653 A1	WO 2002-EP11024 20021002
EP 1436075 B1	WO 2002-EP11024 20021002
DE 60205645 E	WO 2002-EP11024 20021002
DE 60205645 T2	WO 2002-EP11024 20021002
US 7055583 B2	WO 2002-EP11024 20021002
MX 239580 B	WO 2002-EP11024 20021002
RU 2298432 C2	WO 2002-EP11024 20021002
IN 229935 B PCT Application	WO 2002-EP11024 20021002
RU 2298432 C2	RU 2004-115336 20021002
MX 2004003653 A1	MX 2004-3653 20040419
MX 239580 B	MX 2004-3653 20040419
US 20050061490 A1	US 2004-493035 20040419
US 7055583 B2	US 2004-493035 20040419
IN 2004CN01083 P4	IN 2004-CN1083 20040517
IN 229935 B	IN 2004-CN1083 20040517
CN 100577275 C	CN 2002-820795 20021002

FILING DETAILS:

PATENT NO	KIND		PATENT NO	
DE 60205645	E	Based on	EP 1436075	A
DE 60205645	T2	Based on	EP 1436075	A
EP 1436075	A1	Based on	WO 2003035241	A
AU 2002347040	A1	Based on	WO 2003035241	A
BR 2002013343	A	Based on	WO 2003035241	A
MX 2004003653	A1	Based on	WO 2003035241	A
EP 1436075	B1	Based on	WO 2003035241	A
DE 60205645	E	Based on	WO 2003035241	A
US 7055583	B2	Based on	WO 2003035241	A
DE 60205645	T2	Based on	WO 2003035241	A
MX 239580	B	Based on	WO 2003035241	A
RU 2298432	C2	Based on	WO 2003035241	A
AU 2002347040	B2	Based on	WO 2003035241	A

PRIORITY APPLN. INFO: EP 2001-124956 20011019
INT. PATENT CLASSIF.:
MAIN: B01J0008-02
SECONDARY: F28D0009-00; F28F0003-14
IPC ORIGINAL: B01J0019-24 [I,A]; B01J0019-24 [I,C]; B01J0008-02 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; F28D0009-00 [I,C];

F28D0009-00 [I,A]; F28D0009-00 [I,C]; F28F0003-00 [I,C]; F28F0003-14 [I,A]; F28F0009-22 [I,A]; F28F0009-22 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; F28D0009-00 [I,A]; F28D0009-00 [I,C]; F28F0003-00 [I,C]; F28F0003-14 [I,A]

IPC RECLASSIF.: B01J0019-24 [I,A]; B01J0019-24 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; F28D0009-00 [I,A]; F28D0009-00 [I,C]; F28F0003-00 [I,C] ; F28F0003-14 [I,A]

ECLA: B01J0008-02B2; B01J0008-02H; B01J0019-24R4; F28D0009-00B; F28D0009-00F; F28F0009-02S6C

ICO: L01J0208:02A2

USCLASS NCLM: 165/145.000

NCLS: 165/157.000; 165/170.000

BASIC ABSTRACT:

EP 1306126 A1 UPAB: 20060119

NOVELTY - The heat exchange unit includes rectangular, flattened box-shaped heat exchangers (13), distributed in coaxial and concentric arrays, defining in the unit (12) radial alignments with a radial arrangement.

DETAILED DESCRIPTION - The heat exchange unit is used in isothermal radial or axial-radial reactor (1) with an overall configuration which is annular and cylindrical and has a passage (11) with a predetermined diameter running through it axially .The unit includes rectangular, flattened box-shaped heat exchangers (13), distributed in coaxial and concentric arrays, defining in the unit (12) radial alignments with a radial arrangement. The heat exchangers (13) have long sides (13a) parallel to the axis of the unit (12) and short sides (13b) extending radially. Each of the exchangers (13) comprise an inner chamber (17), intended to be passed through by an operating heat exchange fluid, at least one distributor pipe and at least one collector pipe (20) of the operating fluid, associated with two respective opposing sides (13a) of the exchanger (13) and extending along them. The distributor pipe and the collector pipe are in fluid communication, on the one side, with the inner chamber through at least one opening, and on the other side, with the outside of the exchanger (13), through respective inlet and outlet fittings (21,22) for the operating fluid.

An INDEPENDENT CLAIM is included for an isothermal chemical reactor comprising a cylindrical shell (2), a catalytic basket (7), supported in the shell and having cylindrical and coaxial outer and inner walls (8, 10), respectively, and a bottom wall (7b). The heat exchanger unit is supported in the basket.

USE - The heat exchanger unit is used in reactors useful for carrying out exothermic and endothermic reactions occurring under isothermal conditions.

ADVANTAGE - The heat exchange unit has improved efficiency and reaction yields are increased.

DESCRIPTION OF DRAWINGS - The drawing shows a partial view of a radial isothermal reactor.

Reactor (1)

Reactor shell (2)

Catalytic basket (7)

Heat exchange unit (12)

Heat exchangers (13)

Inner chamber (17)

Collector pipe (20)

FILE SEGMENT: CPI; GMPI

MANUAL CODE: CPI: J08-C02; J08-D01

L51 ANSWER 11 OF 13 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN

ACCESSION NUMBER: 2002-575006 [61] WPIX
DOC. NO. CPI: C2002-162799 [61]
DOC. NO. NON-CPI: N2002-455887 [61]
TITLE: Pseudo-isothermal catalytic reactor, for exothermic or endothermic chemical reactions, has several modular heat exchangers having cross dimensions smaller than diameter of manhole
DERWENT CLASS: J04; Q78
INVENTOR: FILIPPI E; RIZZI E; TAROZZO M; ENRICO R; ERMANNO F; MIRCO T
PATENT ASSIGNEE: (METH-N) METHANOL CASALE SA
COUNTRY COUNT: 97

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 20020088613	A1	20020711	(200261)*	EN	10[4]	
EP 1221339	A1	20020710	(200268)	EN		
WO 2002053276	A1	20020711	(200270)	EN		
EP 1347825	A1	20031001	(200365)	EN		
BR 2001016729	A	20031223	(200406)	PT		
AU 2002233290	A1	20020716	(200427)	EN		
EP 1347825	B1	20050309	(200519)	EN		
DE 60109326	E	20050414	(200525)	DE		
MX 2003006064	A1	20040701	(200545)	ES		
EP 1347825	B9	20050713	(200547)	EN		
CN 1606469	A	20050413	(200554)	ZH		
IN 2003CN01125	P4	20050422	(200560)	EN		
US 6955792	B2	20051018	(200568)	EN		
DE 60109326	T2	20060413	(200626)	DE		
MX 232462	B	20051130	(200634)	ES		
RU 2279307	C2	20060710	(200645)	RU		
CN 1265871	C	20060726	(200678)	ZH		
AU 2002233290	B2	20060601	(200705)	EN		
CA 2433775	C	20090210	(200914)	EN		
IN 223643	B	20081121	(200972)	EN		

APPLICATION DETAILS:

PATENT NO KIND	APPLICATION	DATE
US 20020088613 A1	US 2002-35293	20020104
IN 2003CN01125 P4	WO 2001-EP15271	
EP 1221339 A1	EP 2001-100363	20010105
BR 2001016729 A	BR 2001-16729	20011221
CA 2433775 C	CA 2001-2433775	20011221
CN 1606469 A	CN 2001-821732	20011221
CN 1265871 C	CN 2001-821732	20011221
DE 60109326 E	DE 2001-60109326	20011221
DE 60109326 T2	DE 2001-60109326	20011221
EP 1347825 A1	EP 2001-984883	20011221
EP 1347825 B1	EP 2001-984883	20011221
DE 60109326 E	EP 2001-984883	20011221
EP 1347825 B9	EP 2001-984883	20011221
DE 60109326 T2	EP 2001-984883	20011221
WO 2002053276 A1	WO 2001-EP15271	20011221
EP 1347825 A1	WO 2001-EP15271	20011221

BR 2001016729 A	WO 2001-EP15271 20011221
EP 1347825 B1	WO 2001-EP15271 20011221
DE 60109326 E	WO 2001-EP15271 20011221
MX 2003006064 A1	WO 2001-EP15271 20011221
EP 1347825 B9	WO 2001-EP15271 20011221
DE 60109326 T2	WO 2001-EP15271 20011221
MX 232462 B	WO 2001-EP15271 20011221
RU 2279307 C2	WO 2001-EP15271 20011221
CA 2433775 C PCT Application	WO 2001-EP15271 20011221
AU 2002233290 A1	AU 2002-233290 20011221
AU 2002233290 B2	AU 2002-233290 20011221
RU 2279307 C2	RU 2003-122764 20011221
MX 2003006064 A1	MX 2003-6064 20030704
MX 232462 B	MX 2003-6064 20030704
IN 2003CN01125 P4	IN 2003-CN1125 20030722
IN 223643 B PCT Application	WO 2001-EP15271 20011221
IN 223643 B	IN 2003-CN1125 20030722

FILING DETAILS:

PATENT NO	KIND		PATENT NO	
DE 60109326	E	Based on	EP 1347825	A
DE 60109326	T2	Based on	EP 1347825	A
EP 1347825	A1	Based on	WO 2002053276	A
BR 2001016729	A	Based on	WO 2002053276	A
AU 2002233290	A1	Based on	WO 2002053276	A
EP 1347825	B1	Based on	WO 2002053276	A
DE 60109326	E	Based on	WO 2002053276	A
MX 2003006064	A1	Based on	WO 2002053276	A
EP 1347825	B9	Based on	WO 2002053276	A
DE 60109326	T2	Based on	WO 2002053276	A
MX 232462	B	Based on	WO 2002053276	A
RU 2279307	C2	Based on	WO 2002053276	A
AU 2002233290	B2	Based on	WO 2002053276	A
CA 2433775	C	Based on	WO 2002053276	A

PRIORITY APPLN. INFO: EP 2001-100363 20010105
INT. PATENT CLASSIF.:
MAIN: B01J0008-02
SECONDARY: F28D0009-00; F28F0009-00
IPC ORIGINAL: B01J0008-02 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; F28D0009-00 [I,A]; F28D0009-00 [I,C]; F28D0009-00 [I,A]; F28D0009-00 [I,C]; F28F0003-00 [I,C] ; F28F0003-04 [I,A]; F28F0009-00 [I,A]; F28F0009-00 [I,C]; F28F0009-00 [I,A]; F28F0009-00 [I,C]
IPC RECLASSIF.: B01J0008-02 [I,A]; B01J0008-02 [I,C]; F28D0009-00 [I,A]; F28D0009-00 [I,C]; F28F0003-00 [I,C]; F28F0003-04 [I,A]; F28F0009-00 [I,A]; F28F0009-00 [I,C]
ECLA: B01J0008-02D4; B01J0008-02H; F28D0009-00B; F28D0009-00F; F28F0003-04B2
ICO: L01J0208:00C2D2F; L01J0219:00A4C; L01J0219:24R4B6
USCLASS NCLM: 165/182.000; 422/190.000
NCLS: 165/182.000; 422/198.000; 422/199.000; 422/202.000
BASIC ABSTRACT:

US 20020088613 A1 UPAB: 20060120

NOVELTY - The pseudo-isothermal catalytic reactor comprises a cylindrical shell (2) closed at ends by top and bottom dished ends (4,3). The reaction zone (6) defined between dotted lines (7,8) has heat exchange unit (10) submerged in suitable catalytic bed. The heat exchange unit (10) is formed of several modular heat exchangers (11) having cross-dimensions smaller than the diameter of manhole (5).

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is included for heat exchange unit for pseudo-isothermal catalytic reactor.

USE - For exothermic or endothermic chemical reactions.

ADVANTAGE - Enables easy removal of obsolete heat exchange unit and replacing as modular heat exchangers used have cross dimensions smaller than diameter of the manhole on top of reactor vessel.

DESCRIPTION OF DRAWINGS - The figure is cut away isometric view of pseudo-isothermal reactor.

Cylindrical shell (2)
Bottom dished end (3)
Top dished end (4)
Manhole (5)
Reaction zone (6)
Dotted lines (7, 8)
Heat exchange unit (10)
Modular heat exchangers (11)

FILE SEGMENT: CPI; GMPI
MANUAL CODE: CPI: J04-E06; N06-D

L51 ANSWER 12 OF 13 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 2002-481672 [52] WPIX
DOC. NO. CPI: C2002-137061 [52]
DOC. NO. NON-CPI: N2002-380507 [52]
TITLE: Isothermal reactor for carrying exothermic, e.g. methanol, or endothermic reactions, e.g. styrene, includes tube extending within catalytic bed with cone shaped helicoidal
DERWENT CLASS: J04; Q78
INVENTOR: FILIPPE E; FILIPPI E; RIZZI E; TAROZZO M; PHILIPI E; RISI E; TAROZO M
PATENT ASSIGNEE: (METH-N) METHANOL CASALE SA
COUNTRY COUNT: 30

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
EP 1216750	A1	20020626	(200252)*	EN	14[6]	
AU 2001097236	A	20020620	(200252)	EN		
US 20020085969	A1	20020704	(200252)	EN		
JP 2002233747	A	20020820	(200258)	JA	8	
CN 1363416	A	20020814	(200280)	ZH		
IT 1319549	B	20031020	(200413)	IT		
US 6939520	B2	20050906	(200558)	EN		
AU 783696	B2	20051124	(200606)	EN		
CN 1222352	C	20051012	(200650)	ZH		
EP 1216750	B1	20060802	(200651)	EN		
DE 60121907	E	20060914	(200661)	DE		
DE 60121907	T2	20070419	(200729)	DE		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
EP 1216750 A1		EP 2001-129714	20011213
IT 1319549 B		IT 2000-MI2712	20001214
JP 2002233747 A		JP 2001-378495	20011212
DE 60121907 E		DE 2001-621907	20011213
DE 60121907 E		EP 2001-129714	20011213
US 20020085969 A1		US 2001-13662	20011213
US 6939520 B2		US 2001-13662	20011213
AU 2001097236 A		AU 2001-97236	20011214
AU 783696 B2		AU 2001-97236	20011214
CN 1363416 A		CN 2001-144198	20011214
CN 1222352 C		CN 2001-144198	20011214
DE 60121907 T2		DE 2001-621907	20011213
DE 60121907 T2		EP 2001-129714	20011213

FILING DETAILS:

PATENT NO	KIND		PATENT NO	
DE 60121907	E	Based on	EP 1216750	A
DE 60121907	T2	Based on	EP 1216750	A

PRIORITY APPLN. INFO: IT 2000-MI2712 20001214
INT. PATENT CLASSIF.:
IPC ORIGINAL: B01J0008-02 [I,A]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-02 [I,C]; F28D0007-00 [I,C]; F28D0007-00 [I,C]; F28D0007-08 [I,A]; F28D0007-08 [I,A]
IPC RECLASSIF.: B01J0008-02 [I,A]; B01J0008-02 [I,C]; C01C0001-00 [I,C]; C01C0001-04 [I,A]; C07C0029-00 [I,C]; C07C0029-152 [I,A]; C07C0031-00 [I,C]; C07C0031-04 [I,A]; F28D0007-00 [I,C]; F28D0007-02 [I,A]
ECLA: B01J0008-02B2; B01J0008-02H; C01C0001-04B4; F28D0007-02F
ICO: L01J0208:00C2D2D
USCLASS NCLM: 422/198.000
NCLS: 165/163.000; 422/146.000; 422/173.000; 422/200.000; 422/201.000; 422/238.000; 422/239.000
JAP. PATENT CLASSIF.:
MAIN/SEC.: B01J0008-02 E; C07C0029-152; C07C0031-04
FTERM CLASSIF.: 4G070; 4H006; 4G070/AA01; 4H006/AA04; 4G070/AB01; 4H006/AC41; 4G070/BB02; 4H006/BC10; 4H006/BC11; 4H006/BD81; 4H006/BE20; 4G070/CA25; 4G070/CB02; 4G070/CC02; 4G070/DA23; 4H006/FE11
BASIC ABSTRACT:
EP 1216750 A1 UPAB: 20060119

NOVELTY - An isothermal reactor comprises a vertical, cylindrical outer shell (2), catalytic bed(s) provided in the shell and having opposed perforated side walls (4, 5) for the inlet of a flow of reactants and the outlet of flow of reacted substances, and tube(s) (13) for passing a cooling or heating fluid extending within the catalytic bed with a cone shaped helicoidal.

USE - For carrying out all kinds of exothermic (e.g. methanol, ammonia, formaldehyde, organic oxidation such as ethylene oxide), or endothermic reactions , e.g. styrene and methylbenzene.

ADVANTAGE - The reactor has a high capacity, is easy to manufacture and reliable and requires low investment and maintenance costs, and allows to

operate with low pressure drops, low energy consumption and with a high exchange efficiency between reactants and the cooling or heating fluid. It allows recovering or supplying of heat at a higher thermal level while ensuring increase of the heat exchanging efficiency and of the conversion yield. It decreases the required catalyst volume and does not require tube plates.

DESCRIPTION OF DRAWINGS - The figure shows a partial view in longitudinal section of an isothermal reactor.

Outer shell (2)
Side walls (4, 5)
Tube (13)
Ducts (14, 16)

TECHNOLOGY FOCUS:

MECHANICAL ENGINEERING - Preferred Component: The tubes have a constant or variable radial pitch. The radial pitch increases as one approaches the apex of the cone. The winding pitch decreases as the radius of the spiral increases. The tubes are arranged in the catalytic bed at a variable distance between adjacent tubes. They are connected to each other in groups of at least two tubes in fluid communication with a duct (14) for feeding and a duct (16) for drawing off the cooling or heating fluid.

FILE SEGMENT: CPI; GMPI
MANUAL CODE: CPI: J04-X03

L51 ANSWER 13 OF 13 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 2002-012612 [02] WPIX
CROSS REFERENCE: 2007-224999; 2007-863738
DOC. NO. CPI: C2002-003330 [02]
TITLE: Isothermal reactor for performing exothermic or endothermic heterogeneous reactions, comprises cylindrical-shaped outer shell, and plate-type heat exchanger embedded in catalytic layer supported into outer shell
DERWENT CLASS: J04; Q78
INVENTOR: FILIPPI E; RIZZI E; TAROZZO M
PATENT ASSIGNEE: (FILI-I) FILIPPI E; (METH-N) METHANOL CASALE SA; (RIZZ-I) RIZZI E; (TARO-I) TAROZZO M
COUNTRY COUNT: 95

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
EP 1153653	A1	20011114	(200202)*	EN	16[6]	
WO 2001085331	A1	20011115	(200202)	EN		
US 20020018740	A1	20020214	(200214)	EN		
AU 2001065917	A	20011120	(200219)	EN		
EP 1284813	A1	20030226	(200319)	EN		
BR 2001010625	A	20030429	(200335)	PT		
CN 1427741	A	20030702	(200361)	ZH		
US 20030175184	A1	20030918	(200362)	EN		
MX 2002011102	A1	20030601	(200417)	ES		
IN 2002CN01976	P4	20050225	(200546)	EN		
US 6916453	B2	20050712	(200546)	EN		
RU 2265480	C2	20051210	(200581)	RU		
US 6982066	B2	20060103	(200605)	EN		
MX 235127	B	20060323	(200651)	ES		
AU 2001265917	B2	20060608	(200705)	EN		

CN 1281304	C	20061025	(200716)	ZH
EP 1284813	B1	20070801	(200753)	EN
DE 60129686	E	20070913	(200761)	DE
DE 60129686	T2	20080430	(200830)	DE
CA 2407907	C	20090113	(200918)	EN

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
EP 1153653	A1	EP 2000-109968	20000511
IN 2002CN01976	P4	WO 2001-EP4902	
AU 2001065917	A	AU 2001-65917	20010510
AU 2001265917	B2	AU 2001-265917	20010510
BR 2001010625	A	BR 2001-10625	20010510
CN 1427741	A	CN 2001-809286	20010510
CN 1281304	C	CN 2001-809286	20010510
DE 60129686	E	DE 2001-60129686	20010510
DE 60129686	T2	DE 2001-60129686	20010510
EP 1284813	A1	EP 2001-943305	20010510
EP 1284813	B1	EP 2001-943305	20010510
DE 60129686	E	EP 2001-943305	20010510
DE 60129686	T2	EP 2001-943305	20010510
US 20020018740	A1	US 2001-852014	20010510
US 6916453	B2	US 2001-852014	20010510
WO 2001085331	A1	WO 2001-EP4902	20010510
EP 1284813	A1	WO 2001-EP4902	20010510
BR 2001010625	A	WO 2001-EP4902	20010510
US 20030175184	A1	WO 2001-EP4902	20010510
MX 2002011102	A1	WO 2001-EP4902	20010510
RU 2265480	C2	WO 2001-EP4902	20010510
US 6982066	B2	WO 2001-EP4902	20010510
MX 235127	B	WO 2001-EP4902	20010510
EP 1284813	B1	WO 2001-EP4902	20010510
DE 60129686	E	WO 2001-EP4902	20010510
DE 60129686	T2	WO 2001-EP4902	20010510
RU 2265480	C2	RU 2002-133093	20010510
MX 2002011102	A1	MX 2002-11102	20021111
MX 235127	B	MX 2002-11102	20021111
IN 2002CN01976	P4	IN 2002-CN1976	20021202
US 20030175184	A1	US 2003-275772	20030513
US 6982066	B2	US 2003-275772	20030513
EP 1284813	B1 Related to	EP 2006-24989	20061204
EP 1284813	B1 Related to	EP 2007-9542	20070511
CA 2407907	C	CA 2001-2407907	20010510
CA 2407907	C PCT Application	WO 2001-EP4902	20010510

FILING DETAILS:

PATENT NO	KIND		PATENT NO	
DE 60129686	E	Based on	EP 1284813	A
DE 60129686	T2	Based on	EP 1284813	A
EP 1284813	B1	Related to	EP 1757360	A
AU 2001065917	A	Based on	WO 2001085331	A
EP 1284813	A1	Based on	WO 2001085331	A
BR 2001010625	A	Based on	WO 2001085331	A
MX 2002011102	A1	Based on	WO 2001085331	A
RU 2265480	C2	Based on	WO 2001085331	A
US 6982066	B2	Based on	WO 2001085331	A

MX 235127	B	Based on	WO 2001085331	A
AU 2001265917	B2	Based on	WO 2001085331	A
EP 1284813	B1	Based on	WO 2001085331	A
DE 60129686	E	Based on	WO 2001085331	A
DE 60129686	T2	Based on	WO 2001085331	A
CA 2407907	C	Based on	WO 2001085331	A

PRIORITY APPLN. INFO: EP 2000-109968 20000511
INT. PATENT CLASSIF.:
MAIN: B01J0008-02
SECONDARY: B01J0008-04
IPC ORIGINAL: B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-04 [I,A]; B01J0008-04 [I,C]; B01J0008-04 [I,A]; B01J0008-04 [I,C]; F28D0001-00 [I,C]; F28D0001-02 [I,C]; F28D0001-03 [I,A]; F28D0001-06 [I,A]; F28D0009-00 [I,A]; F28D0009-00 [I,C]; F28F0009-26 [I,A]; F28F0009-26 [I,C]
IPC RECLASSIF.: B01J0019-24 [I,A]; B01J0019-24 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-04 [I,A]; B01J0008-04 [I,C]; F28D0009-00 [I,A]; F28D0009-00 [I,C]; F28F0009-26 [I,A]; F28F0009-26 [I,C]
ECLA: B01J0008-02B2; B01J0008-02D2; B01J0008-02H; B01J0008-04D2D; B01J0008-04H; B01J0019-24R4; F28D0009-00B; F28D0009-00E; F28D0009-00P; F28F0009-02S6C; F28F0009-26
ICO: L01J0208:00C2D2F; L01J0208:02A2; L01J0208:02D2B; L01J0219:00A4C; L01J0219:24R4B10B; L01J0219:24R4B2; L01J0219:24R4B6; L01J0219:24R4D2; L01J0219:24R4P2D; L01J0219:24R4P4B; L01J0219:24R4R2B; L01J0219:24R4R2B2
USCLASS NCLM: 422/198.000
NCLS: 422/190.000; 422/200.000; 422/201.000; 422/211.000
BASIC ABSTRACT:

EP 1153653 A1 UPAB: 20060202

NOVELTY - An isothermal reactor (1) for performing exothermic or endothermic heterogeneous reactions comprises a cylindrical-shaped outer shell (2), and a heat exchanger (9) embedded in a catalytic layer (10) which is supported into the outer shell. The heat exchanger (9) is a plate (14) type heat exchanger.

DETAILED DESCRIPTION - The plates (14) comprise ducts (6) extending in parallel and perpendicularly, to the axis of outer shell. The heat exchangers are arranged radially in catalytic layer.

An INDEPENDENT CLAIM is also included for the production of the reactor.

USE - For performing exothermic or endothermic heterogeneous reactions.

ADVANTAGE - The isothermal reactor has high capacity, high reliability, improved temperature uniformity and simple structure, and is inexpensive. The reactor can be maintained easily, and can operate with high conversion yield, low pressure drop, low energy consumption and high heat exchange efficiency between reactants and heat exchange fluid. The reactors can be manufactured easily and effectively at high heat exchange degree. The reactor has good mechanical stress and heat resistance property.

DESCRIPTION OF DRAWINGS - The figure shows a partial perspective view of the reactor.

Isothermal reactor (1)

Outer shell (2)

```
            Duct (6)
              Heat exchangers (9)
            Catalytic layer (10)
            Plates (14)
FILE SEGMENT:          CPI; GMPI
MANUAL CODE:           CPI: J04-E07


=> D L44 1-17 IFULL

L44  ANSWER 1 OF 17  WPIX COPYRIGHT 2010       THOMSON REUTERS on STN
ACCESSION NUMBER:      2002-089899 [12]   WPIX
DOC. NO. CPI:          C2002-027746 [12]
TITLE:                 Apparatus for isothermal operation of
                       heterogeneously catalyzed gas phase
                       reaction with high heat change, e.g. gas
                       phase oxidation of alcohol to aldehyde, has narrow
                       reactor containing flexible, and
                       catalyst-coated strips
DERWENT CLASS:         E17; J04; Q73; Q78
INVENTOR:              BROECKER F J; HAAKE M; SCHWAB E; STROEZEL M; WOERZ O;
                       BREKER F J
PATENT ASSIGNEE:       (BADI-C) BASF AG; (BROE-I) BROECKER F J; (HAAK-I)
                       HAAKE M; (SCHW-I) SCHWAB E; (STRO-I) STROEZEL M;
                       (WOER-I) WOERZ O
COUNTRY COUNT:         31

PATENT INFORMATION:

      PATENT NO      KIND DATE     WEEK     LA  PG         MAIN IPC
      -----------------------------------------------------------------
      WO 2001089683   A2 20011129 (200212)* DE  20[3]
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      DE 10025382     A1 20011206 (200212)  DE
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      EP 1289650      A2 20030312 (200320)  DE
      KR 2003022131   A  20030315 (200350)  KO
      US 20030159799  A1 20030828 (200357)  EN
      CN 1437506      A  20030820 (200374)  ZH
      JP 2003534299   W  20031118 (200401)  JA  23
      TW 575462       A  20040211 (200454)  ZH
      CN 1188212      C  20050209 (200622)  ZH

APPLICATION DETAILS:

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      WO 2001089683 A2                        WO 2001-EP6034 20010525
      DE 10025382 A1                          DE 2000-10025382
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      TW 575462 A                             TW 2001-112515 20010524
      CN 1437506 A                            CN 2001-811551 20010525
      EP 1289650 A2                           EP 2001-957805 20010525
      JP 2003534299 W                         JP 2001-585916 20010525
      EP 1289650 A2                           WO 2001-EP6034 20010525
      US 20030159799 A1                       WO 2001-EP6034 20010525
      JP 2003534299 W                         WO 2001-EP6034 20010525
      US 20030159799 A1                       US 2002-296255 20021121
      KR 2003022131 A                         KR 2002-715864 20021123
      CN 1188212 C                            CN 2001-811551 20010525
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FILING DETAILS:

PATENT NO	KIND	PATENT NO
EP 1289650 A2	Based on	WO 2001089683 A
JP 2003534299 W	Based on	WO 2001089683 A

PRIORITY APPLN. INFO: DE 2000-10025382 20000524
INT. PATENT CLASSIF.:
MAIN: B01J0019-24; C07C0045-38
IPC RECLASSIF.: B01J0012-00 [I,A]; B01J0012-00 [I,C]; B01J0019-00 [I,A]; B01J0019-00 [I,C]; B01J0019-24 [I,A]; B01J0019-24 [I,C]; C07B0061-00 [I,A]; C07B0061-00 [I,C]; C07C0045-00 [I,C]; C07C0045-38 [I,A]; C07C0047-20 [I,C]; C07C0047-21 [I,A]; F28D0009-00 [I,C]; F28D0009-04 [I,A]
ECLA: B01J0012-00P; B01J0019-00B2; B01J0019-24; B01J0019-24R; C07C0045-38; C07C0045-38+47/21; F28D0009-04
ICO: L01J0219:00B2D2F; L01J0219:00B2D4F; L01J0219:194B5; L01J0219:324P; L01J0219:324P2
USCLASS NCLM: 165/004.000
JAP. PATENT CLASSIF.:
MAIN/SEC.: B01J0019-24 A; C07B0061-00 300; C07C0045-38; C07C0047-21
FTERM CLASSIF.: 4G075; 4H006; 4H039; 4H006/AA02; 4G075/AA03; 4H006/AA04; 4H006/AC45; 4G075/BA01; 4H006/BA05; 4G075/BA06; 4H006/BC13; 4G075/BD12; 4H006/BD80; 4H006/BD81; 4H006/BE30; 4G075/CA54; 4H039/CA62; 4H039/CC20; 4G075/EC30; 4G075/FA16; 4G075/FB03; 4G075/FB06; 4G075/FB12; 4G075/FC01

BASIC ABSTRACT:
WO 2001089683 A2 UPAB: 20050524

NOVELTY - Apparatus for isothermal operation of heterogeneously catalyzed gas phase reaction with high heat change has reaction chamber(s) with inlet and outlet. The chamber is bounded by walls, cooled by heat exchange medium, and contains flexible, gas-permeable, catalyst-coated strips with a surface area/volume ratio of 50-5000 m3/m2 and good thermal conductivity.

DETAILED DESCRIPTION - Apparatus for largely isothermal operation of a heterogeneously catalyzed reaction in the gas phase with high heat change has reaction chamber(s) with inlet and outlet. The reaction chamber is bounded by walls removing heat, which have a constant distance not less than 30 mm along the main flow axis. The chamber contains catalyst-coated strips, which are flexible in all directions and permeable for the reaction gas and have a surface area/volume ratio of 50-5000 m2/m3 and good thermal conductivity. The reaction gas flows through the chamber at least 200 m3/m2-hour and a heat exchange medium flows on the other side of the wall.

USE - The apparatus is used for gas phase oxidation of alcohols to aldehydes, especially of 3-methyl-3-buten-1-ol to 3-methyl-2-butenal (all claimed). The apparatus is especially useful in oxidative dehydrogenation and can be used for operating both strongly exothermic and endothermic reactions, e.g. with enthalpy in the 30-75 kcal/mole range, such as strongly endothermic oxidative dehydrogenation of 3-methyl-3-buten-1-ol and strongly exothermic hydrogenation of double or triple bonds and aromatics, e.g. hydrogenation of benzene to cyclohexane.

ADVANTAGE - The reactor allows good heat removal or supply at the site of the reaction with a good surface/volume ratio of the catalyst.

DESCRIPTION OF DRAWINGS - The drawing shows a plate heat exchanger reactor.

Plate heat exchanger reactor (101)
Catalyst-coated strips (120)
Reaction gas inlet (11)
Heat exchange medium outlet (142)
Reaction gas outlet (143)
Heat exchange medium inlet (144) TECHNOLOGY FOCUS:

CHEMICAL ENGINEERING - Preferred Apparatus: The reaction chamber is formed by the gap of a heat exchanger, preferably a spiral, plate or annular gap heat exchanger. The strips are made from metals, asbestos substitute, glass fibers, carbon fibers and plastics, especially a piece of metal fabric or knit. As they are randomly aligned with respect to the main gas flow axis, the sequence of hollow spaces, wires or filaments is also random. The reactor wall distance is 0.5-30, preferably 1-20, especially 1.5-10 mm.

EXTENSION ABSTRACT:

EXAMPLE - The oxidation of 3-methyl-3-buten-1-ol (I) to 3-methyl-2-butenal (II)was carried out on a silver (Ag) catalyst. In method (A), the catalyst was obtained by coating a strip of heat-resistant woven steel tape (material number 1.4764) on both sides with 300 nm Ag in electron beam vapor deposition apparatus. An unshaped, double layer of 50 cm2 catalyst was placed in a 2 mm wide ring gap heat exchanger reactor. The amount of active component was 34 mg Ag. Control (B) used a stationary bed reactor with a 30 mm high Ag granulate layer. A mixture of 85 weight% (I) and 15 weight% water was vaporized at 150 degreesC, mixed with preheated air and heated to the reactor inlet temperature or 370 degreesC in a preheater. After leaving the reactor, the reaction product was cooled in 2 stages. The combined condensates were separated into an organic and an aqueous phase, which were analyzed. The cross-sectional charge of (I) was (A) 279, (B) 69 g/cm2-hour and amount of air (A) 94, (B) 27 l/cm2-hour. Both methods gave 54% conversion. However, the selectivity was (A) 83, (B) 73%. Hence (A) gave 10% higher selectivity and was also more economical than (B), as it used only 0.034 g Ag, instead of 17 g and could also give higher conversion/hour at higher flow velocities.

FILE SEGMENT: CPI; GMPI
MANUAL CODE: CPI: E10-D01B; E10-D01C; E11-E; J04-E02; N02-E03; N06-C07; N06-D; N06-E01; N06-F; N07-C01

L44 ANSWER 2 OF 17 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 2002-066893 [09] WPIX
DOC. NO. CPI: C2002-019988 [09]
TITLE: Preparation of N-(phosphonomethyl)glycine product, useful as broad-spectrum post-emergent herbicide, comprises oxidizing N-(phosphonomethyl)iminodiacetic acid substrate in presence of oxidation catalyst
DERWENT CLASS: C03
INVENTOR: ARHANCET J; CANANOVA E; CASANOVA E; CHIEN H; CZYN H; EDUARDO C; ERIC H; HAUPFEAR E; HEISE J; HEISE J D; HENRY C; HOOPER B; HOOPER W; HOOPER W B; HUBO W B; JORGENSON A I; JORGENSON A L; JORGENSON I; JUAN A; KENT W; LEIBER A; LEIBER M A; MICHAEL R; ROGERS M; ROJERS M; SCHOLLE W; WILLIAM H; WILLIAM S; WITTELER

K; WITTLER K; WITTLER K A; WITTLER L R; HAUPFEAR E A
PATENT ASSIGNEE: (MONS-C) MONSANTO CO; (MONS-C) MONSANTO TECHNOLOGY LLC
COUNTRY COUNT: 93

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
WO 2001092272 <--	A2	20011206	(200209)*	EN	310[35]	
AU 2001062930 <--	A	20011211	(200225)	EN		
US 20020068836 <--	A1	20020606	(200241)	EN		
EP 1283841	A2	20030219	(200321)	EN		
CN 1430622	A	20030716	(200363)	ZH		
US 20030171611	A1	20030911	(200367)	EN		
MX 2002011616	A1	20030301	(200413)	ES		
BR 2001011041	A	20040615	(200440)	PT		
IN 2002CN01902	P4	20050211	(200540)	EN		
US 6927304	B2	20050809	(200552)	EN		
EP 1283841	B1	20051116	(200579)	EN		
DE 60115019	E	20051222	(200603)	DE		
US 7015351	B2	20060321	(200621)	EN		
US 20060079712	A1	20060413	(200626)	EN		
ES 2253383	T3	20060601	(200638)	ES		
CN 1743335	A	20060308	(200644)	ZH		
EP 1676851	A2	20060705	(200644)	EN		
CN 1221558	C	20051005	(200650)	ZH		
DE 60115019	T2	20060803	(200651)	DE		
MX 238209	B	20060628	(200680)	ES		
TW 247746	B1	20060121	(200713)	ZH		
AU 2001262930	B2	20070419	(200763)	EN		
CN 100393733	C	20080611	(200865)	ZH		
CN 101311183	A	20081126	(200904)	ZH		
US 7504534	B2	20090317	(200920)	EN		
EP 1676851	A3	20090603	(200936)	EN		
US 20090259068	A1	20091015	(200968)	EN		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 2001092272	A2	WO 2001-US10826	20010522
US 20020068836	A1 Provisional	US 2000-206562P	20000522
US 20030171611	A1 Provisional	US 2000-206562P	20000522
US 6927304	B2 Provisional	US 2000-206562P	20000522
US 7015351	B2 Provisional	US 2000-206562P	20000522
US 20060079712	A1 Provisional	US 2000-206562P	20000522
US 7504534	B2 Provisional	US 2000-206562P	20000522
US 20020068836	A1 Provisional	US 2000-220140P	20000721
US 20030171611	A1 Provisional	US 2000-220140P	20000721
US 6927304	B2 Provisional	US 2000-220140P	20000721
US 7015351	B2 Provisional	US 2000-220140P	20000721
US 20060079712	A1 Provisional	US 2000-220140P	20000721
US 7504534	B2 Provisional	US 2000-220140P	20000721
US 20020068836	A1 Provisional	US 2000-230240P	20000901
US 20030171611	A1 Provisional	US 2000-230240P	20000901
US 6927304	B2 Provisional	US 2000-230240P	20000901

US 7015351 B2 Provisional US 2000-230240P 20000901
US 20060079712 A1 Provisional US 2000-230240P 20000901
US 7504534 B2 Provisional US 2000-230240P 20000901
IN 2002CN01902 P4 PCT Application WO 2001-US10826
AU 2001062930 A AU 2001-62930 20010522
AU 2001262930 B2 AU 2001-262930 20010522
BR 2001011041 A BR 2001-11041 20010522
CN 1430622 A CN 2001-809971 20010522
CN 1743335 A Div Ex CN 2001-809971 20010522
CN 1221558 C CN 2001-809971 20010522
DE 60115019 E DE 2001-60115019
20010522
DE 60115019 T2 DE 2001-60115019
20010522
EP 1283841 A2 EP 2001-937167 20010522
EP 1283841 B1 EP 2001-937167 20010522
DE 60115019 E EP 2001-937167 20010522
ES 2253383 T3 EP 2001-937167 20010522
EP 1676851 A2 Div Ex EP 2001-937167 20010522
DE 60115019 T2 EP 2001-937167 20010522
EP 1676851 A3 Div Ex EP 2001-937167 20010522
TW 247746 B1 TW 2001-112244 20010522
US 20020068836 A1 US 2001-863885 20010522
US 20030171611 A1 CIP of US 2001-863885 20010522
US 6927304 B2 CIP of US 2001-863885 20010522
US 7015351 B2 US 2001-863885 20010522
US 20060079712 A1 Div Ex US 2001-863885 20010522
US 7504534 B2 Div Ex US 2001-863885 20010522
EP 1283841 A2 PCT Application WO 2001-US10826 20010522
MX 2002011616 A1 PCT Application WO 2001-US10826 20010522
BR 2001011041 A PCT Application WO 2001-US10826 20010522
EP 1283841 B1 PCT Application WO 2001-US10826 20010522
DE 60115019 E PCT Application WO 2001-US10826 20010522
DE 60115019 T2 PCT Application WO 2001-US10826 20010522
MX 238209 B PCT Application WO 2001-US10826 20010522
US 20030171611 A1 US 2002-295765 20021115
US 6927304 B2 US 2002-295765 20021115
IN 2002CN01902 P4 IN 2002-CN1902 20021121
MX 2002011616 A1 MX 2002-11616 20021122
MX 238209 B MX 2002-11616 20021122
CN 1743335 A CN 2005-10089778
20010522
CN 100393733 C CN 2005-10089778
20010522
EP 1676851 A2 EP 2005-23617 20010522
EP 1676851 A3 EP 2005-23617 20010522
US 20060079712 A1 US 2005-285721 20051122
US 7504534 B2 US 2005-285721 20051122
CN 101311183 A CN 2008-10092607
20010522
US 20090259068 A1 Provisional US 2000-206562P 20000522
US 20090259068 A1 Provisional US 2000-220140P 20000721
US 20090259068 A1 Provisional US 2000-230240P 20000901
US 20090259068 A1 Div Ex US 2001-863885 20010522
US 20090259068 A1 Div Ex US 2005-285721 20051122
US 20090259068 A1 US 2009-365507 20090204

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PATENT NO KIND PATENT NO

DE 60115019	E	Based on	EP 1283841	A
ES 2253383	T3	Based on	EP 1283841	A
EP 1676851	A2	Div ex	EP 1283841	A
DE 60115019	T2	Based on	EP 1283841	A
EP 1676851	A3	Div Ex	EP 1283841	A
US 7504534	B2	Div Ex	US 7015351	B
AU 2001062930	A	Based on	WO 2001092272	A
EP 1283841	A2	Based on	WO 2001092272	A
MX 2002011616	A1	Based on	WO 2001092272	A
BR 2001011041	A	Based on	WO 2001092272	A
EP 1283841	B1	Based on	WO 2001092272	A
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AU 2001262930	B2	Based on	WO 2001092272	A
US 20090259068	A1	Div Ex	US 7015351	B
US 20090259068	A1	Div Ex	US 7504534	B

PRIORITY APPLN. INFO: US 2000-230240P 20000901
US 2000-220140P 20000721
US 2000-206562P 20000522
US 2001-863885 20010522
US 2002-295765 20021115
US 2005-285721 20051122
US 2009-365507 20090204

INT. PATENT CLASSIF.:
MAIN: C07F0009-00; C07F0009-38
SECONDARY: A01N0057-26
IPC ORIGINAL: B01D0001-00 [I,A]; B01D0001-00 [I,C]; B01D0009-00 [I,A]; B01D0009-00 [I,C]; C07F0009-00 [I,C]; C07F0009-00 [I,C]; C07F0009-22 [I,A]; C07F0009-28 [I,A]; C07F0009-38 [I,A]; C07F0009-40 [I,A]
IPC RECLASSIF.: C07F0009-00 [I,C]; C07F0009-38 [I,A]
ECLA: C07F0009-38A1+U6F
USCLASS NCLM: 562/017.000
NCLS: 159/047.100; 203/048.000

BASIC ABSTRACT:
WO 2001092272 A2 UPAB: 20090401

NOVELTY - Preparation of N-(phosphonomethyl)glycine product (I) comprises oxidizing N-(phosphonomethyl)iminodiacetic acid substrate (II) in the presence of an oxidation catalyst (OC).

DETAILED DESCRIPTION - (A) Preparation of N-(phosphonomethyl)glycine product (I) comprises:

(1) introducing an aqueous feed stream (AFS) comprising an N-(phosphonomethyl)iminodiacetic acid substrate (II) into an oxidation reactor system (ORS);

(2) oxidizing (II) in the ORS in the presence of an oxidation catalyst (OC) to produce a reaction product solution (RPS) comprising (I);

(3) dividing the RPS into plural fractions comprising a primary fraction (PF) and a secondary fraction (SF);

(4) precipitating (I) crystals from the PF to produce a primary product slurry (PPS) comprising precipitated (I) crystals and a primary mother liquor (PML); and

(5) precipitating (I) crystals from an aqueous secondary crystallization feed mixture (AM) comprising (I) contained in the SF to produce a secondary product slurry (SPS) comprising precipitated (I) crystals and a secondary mother liquor.

INDEPENDENT CLAIMS are also included for the following:

(B) preparation of (I) comprising steps (1) and (2) followed by step (3a) precipitating (I) from the RPS to produce a PPS comprising precipitated (I) crystals and a primary mother liquor; and (4a) evaporating water from the PML to precipitate additional (I) crystals and producing a secondary mother liquor (SML);

(C) methods (C1)-(C6) of preparing (I);

(D) methods (D1)-(D2) of removal of water from an aqueous starting solution;

(E) continuous processes (e.g. (E1)-(E7)) for the catalytic oxidation of (II) to produce (I).

ACTIVITY - Post-emergent herbicide.

USE - N-(Phosphonomethyl)glycine (i.e. glyphosate) is a broad-spectrum post-emergent herbicide for killing or controlling e.g. germinating seeds, emerging seedlings, maturing and established woody and herbaceous vegetation, and aquatic plants.

ADVANTAGE - The catalyst catalyzes not only the oxidation of (II) but also the oxidation of formaldehyde by-product to formic acid, and formic acid to carbon dioxide. The process may further involve introducing a supplemental catalyst promoter into the reactor system and mixing it with the catalyst. The promoter increases the activity and/or selectivity of the catalyst for the oxidation of (II) to (I), and also for the oxidation of formaldehyde or formic acid. The promoter also reduces NM leaching from the carbon support. Improved methods with increased throughput, reduced cost per unit (I), and reduced concentrations of undesirable by-products (e.g. formaldehyde and formic acid) are therefore achieved.

N-(Phosphonomethyl)iminodiacetic acid (NPMIDA) (16.4 g), activated carbon (Pt/C) catalyst (4.16 g, of which 0.68 g consisted of 3% bismuth (as promoter)/4% platinum on the catalyst's surface), and water (179.4 g) were placed in a 300 ml stainless steel autoclave. The reaction was conducted at a pressure of 65 psig, a temperature of 90 degreesC, an oxygen flow rate of 38 ml/minute, and a stirring rate of 900 rpm. The reaction was allowed to proceed until the NPMIDA was depleted. The product solution was separated from the catalyst via filtration and the solution was neutralized with 6 g of 50% NaOH solution. The catalyst was recycled with no purge through runs. Analysis of the product was conducted for each run. Two controls were also conducted in the same manner as above except that the 0.68 g of the Bi/Pt/C catalyst was omitted. Results showed that the Bi/Pt/C catalyst produced lower levels of the by-products, formaldehyde, formic acid and N-methyl-N-(phosphonomethyl)glycine (NMG) compared to the controls. TECHNOLOGY FOCUS:

ORGANIC CHEMISTRY - Preferred Processes: In (A): the PF is cooled to precipitate (I) crystals from the PF and water is evaporated from the AM to precipitate (I) crystals from the AM. The PF is cooled as water is evaporated from the PF by reducing the pressure. Water is evaporated from the PF under adiabatic conditions. The evaporation cools the PF to a temperature of 45-50 degreesC. 5-30% by weight of the PF is evaporated. The process further comprises decanting PML from the precipitated (I) crystals in the PPS. The process further comprises recycling PML decanted from the precipitated (I) crystals in the PPS to the ORS for use as a source of process water. All the PML decanted from the precipitated (I) crystals in the PPS is recycled to the ORS. The OC comprises a heterogeneous catalyst (HC) comprising a noble metal (NM) deposited on a carbon support. (II) is oxidized in a liquid reaction medium in contact with the OC and Cl- concentration in the liquid reaction medium is maintained at no greater than 500 (preferably no greater than 300) ppm by weight. The Cl- concentration in the liquid reaction medium is maintained at no greater than 100 ppm by weight. A source of (II) is used to prepare the AFS introduced into the reactor system and the concentration of Cl- in the (II) source is less than 5000 ppm by weight on a dry basis. The concentration of Cl- in the

(II) source is less than 3000 (preferably 2000, especially 1000) ppm by weight on a dry basis. The process further comprises purging SML for removal of by-products and impurities from the process. All the SML is purged from the process. The PF is 30-85% of the RPS. The PF is 50-80 (preferably 65-75) % of the RPS. The reactor system comprises a first and a second oxidation reaction zone (ORZ) in series; the AFS is introduced into the first ORZ; (II) is continuously oxidized in the ORZ to produce an intermediate reaction mixture comprising (I) and unreacted (II); an intermediate AFS is introduced into the second ORZ, the intermediate AFS comprising (I) obtained in the intermediate reaction mixture and unreacted (II); (II) is continuously oxidized in the second ORZ to produce the RPS comprising (I); and the RPS is divided into plural fractions comprising the primary and SFs. Evaporative cooling of the PF comprises: introducing an aqueous evaporation feed mixture (FM) into an evaporation zone (EV), the aqueous FM comprising evaporating water from the aqueous evaporation FM in the EV in the presence of solid particulate (I) thereby producing a vapor phase comprising water vapor; precipitating (I) from the aqueous liquid phase, and producing an evaporation product comprising (I) solids and a PML that is saturated or supersaturated in (I); and maintaining a ratio of particulate (I) solids to PML in the EV which exceeds the ratio of (I) solids incrementally produced by the effects of evaporation to mother liquor (ML) incrementally produced thereby. The evaporation product is divided to provide an (I) solids fraction that is relatively depleted in ML and a PML fraction that is relatively depleted in (I) solids. Maintaining the ratio of particulate (I) solids to ML in the EV comprises returning solids obtained in the solids fraction to the EV or retaining solids obtained in the solid fraction within the zone. The process comprises introducing an evaporation FM comprising the PF into a vapor/liquid separation zone (V/LSZ) of the EV where the pressure is below the vapor pressure of the mixture, thereby allowing water to flash from the evaporation FM, producing a vapor phase comprising water vapor, precipitating (I) from the liquid phase to produce a first slurry stream (FSS) comprising particulate (I) in a saturated or supersaturated ML; separating the vapor phase from FSS; introducing the FSS into a retention zone in which a supernatant liquid comprising a fraction of the ML is separated from an SSS comprising precipitated (I) and ML, the retention zone having an inlet for the first slurry, a decantation liquid exit for the supernatant liquid spaced above the inlet, and an exit for the second slurry spaced above the inlet but below the decantation liquid exit; and maintaining the relative rates at which the first slurry is introduced into the retention zone, the second slurry is drawn off through the second slurry exit and the supernatant liquid is drawn off through the decantation liquid exit such that the upward flow velocity in a lower region of the retention zone below the second slurry exit is sufficient to maintain precipitated (I) in suspension in the liquid phase while the upward flow velocity in an upper region of the retention zone above the second slurry exit is below the sedimentation velocity of at least 80% by weight of the (I) particles in the lower region. At least a portion of the SSS is recirculated to the V/LSZ. At least a portion of the SSS and the PF together comprise the evaporation FM, introduced into the V/LSZ. A third slurry stream (TSS)is removed from the lower region of the zone. The relative rates of the flow of the PF to the V/LSZ, recirculation of all or part of SSS to the V/LSZ, withdrawal of the supernatant liquid from the decantation liquid exit, withdrawal of the SS from the lower region of the

retention zone, and return to the EV of any liquid or solids bearing streams from any solids-liquid separations to which the third slurry may be subjected, are sufficient to establish a ratio of (I) solids to ML in the lower region of the zone that is higher than the ratio of precipitated solid (I) incrementally produced by the effects of evaporation of the PF to ML incrementally produced thereby. The relative flow rates of the streams are controlled so that the (I) solids concentration in the lower region of the zone is at least twice the concentration of (I) solids in the mixture of such solids and ML that is or would be produced by flashing of the PF in the vapor/liquid zone in the absence of the recirculated SSS. Solids are removed from the third slurry to produce a recycle liquid fraction which is recirculated to the V/LSZ, whereby the evaporation FM further comprises the recycle liquid fraction. Both the PF and the recycle liquid fraction are mixed with the SSS prior to introduction into the V/LSZ. The SF is introduced into a secondary reactor system comprising a tertiary ORZ, unreacted (II) contained in the SF being converted to (I) in the tertiary ORZ to produce a tertiary oxidation reaction mixture, the secondary crystallization FM comprising (I) contained in the tertiary oxidation reaction mixture. The relative flow rates of all of the streams, including the recycle liquid fraction, are controlled so that the solids content of the slurry in the lower region of the zone is at least 12 weight%. The process further comprises decanting PML from the precipitated (I) crystals in the PPS. The process further comprises recycling PML to the ORS for use as a source of water. The process further comprises purging SML for removal of by-products and impurities from the process. The ORS comprises a series of at least two continuous ORZs, the process further comprising: separating the OC from RPS; and continuously recycling the separated OC to at least one of the ORZs.

In (B), the RPS is cooled to precipitate (I) crystals from the RPS. The RPS is cooled as water is evaporated from the RPS by reducing the pressure. Water is evaporated from the RPS under adiabatic conditions. The evaporation cools the RPS to a temperature of from 45 degreesC to 80 degreesC. 5-30 weight% of the RPS is evaporated. The process further comprises purging SML for removal of by-products and impurities from the process. The SML is purged from the process.

In (C1), preparation of (I) comprises introducing an AFS comprising (II) into a primary ORS comprising one or more ORZs; (II) in the primary ORS to produce RPS comprising (I) and unreacted (II); dividing the RPS into plural fractions comprising a PF and a secondary oxidation reactor feed fraction; precipitating (I) crystals from the PF to produce a PPS comprising precipitated (I) crystals and a PML; introducing the secondary oxidation reactor feed fraction into a secondary ORS comprising one or more ORZs; oxidizing (II) in the secondary ORS to produce a secondary oxidation reactor effluent comprising (I); and precipitating (I) crystals from the secondary oxidation reactor effluent to produce a SPS comprising precipitated (I) crystals and SML. The PF is cooled to precipitate (I) crystals from the PF and water is evaporated from the secondary oxidation reactor effluent to precipitate (I) crystals from the secondary oxidation reactor effluent. The PF is cooled as water is evaporated from the PF by reducing the pressure. The water is evaporated from the PF under adiabatic conditions. The primary reactor system comprises multiple ORZs in series. The RPS is divided after the last ORZ in the series. The RPS is divided before the last ORZ in the series and the PF passes through at least one

further ORZ in the primary reactor system before precipitating (I) crystals from the PF. The primary reactor system comprises a single ORZ. The secondary ORS comprises a stirred tank reactor. The secondary ORS comprises a fixed bed reactor. The fixed bed reactor is operated with co-current gas and liquid flows through the ORZ. The fixed bed reactor is operated adiabatically. The secondary oxidation feed fraction is cooled prior to introduction into the secondary ORS.

In (C2), preparing (I) comprises oxidizing (II), the process comprising: introducing (II) into a liquid reaction medium within an ORZ, the ORZ being back-mixed in the liquid phase and containing a catalyst for the oxidation reaction in contact with the liquid reaction medium, the liquid reaction medium comprising (I); introducing an oxidizing agent into the ORZ; continuously oxidizing (II) in the ORZ to form (I); and continuously withdrawing a reaction mixture effluent comprising (I) from the ORZ. Preferably, the ORZ is provided by an ejector nozzle loop reactor. The oxidizing agent is an O2-containing gas (OG) and is introduced simultaneously with the AFS into the ORZ through an ejector nozzle of the ejector nozzle loop reactor . The ORZ may also be provided by a fluidized bed reactor. The ORZ is provided by a continuous stirred tank reactor. The concentration of the particulate catalyst (PC) within the ORZ is 0. 1-1 0 weight% based on the total weight of catalyst and the liquid reaction medium in the ORZ. The process further comprises cooling the liquid reaction medium. The liquid reaction medium is cooled in an external heat transfer recirculation loop comprising a heat exchanger. The oxidizing agent is OG and is sparged into the liquid reaction medium within the ORZ. The reaction mixture effluent withdrawn from the ORZ is free of the PC, the stirred tank reactor comprising an internal catalyst filter for preventing the PC from being withdrawn from the ORZ with the reaction mixture effluent. The reaction mixture effluent withdrawn from the ORZ further comprises the PC the process further comprising: separating the PC from the reaction mixture effluent to form a catalyst recycle stream comprising the separated PC and introducing at least a portion of the PC contained in the catalyst recycle stream into the ORZ. The catalyst is purged from the catalyst recycle stream. Fresh catalyst is added to the catalyst recycle stream. The PC is separated from the reaction mixture effluent in a catalyst filter to form the catalyst recycle stream and a filtrate free of the PC and comprising (I). The catalyst filter is adapted for continuous separation of PC from the reaction mixture effluent. The reaction mixture effluent further comprises dissolved CO2, the reaction mixture effluent being passed through a flash tank before being introduced into the catalyst filter to lower the pressure on the reaction mixture effluent and remove dissolved CO2 from the reaction mixture effluent. At least a portion of the PC contained in the catalyst recycle stream passes through a catalyst holding tank before being introduced into the ORZ. The catalyst holding tank is free of O2. The process further comprises introducing a non-oxidizing gas into the catalyst holding tank. The residence time of the reclaimed catalyst in the

catalyst holding tank is at least 2 minutes. The filtrate comprises unreacted (II), the process further comprising: continuously introducing the filtrate into a second ORZ; introducing an oxidizing agent into the second ORZ, and continuously oxidizing (II) in the second ORZ to form additional (I). The second ORZ is back-mixed in the liquid phase. The second ORZ is provided by a second stirred tank reactor. The second ORZ may also be provided by an ejector nozzle loop reactor. The second ORZ is provided by a fixed bed reactor.

In (C3), preparation of (I) comprises oxidizing (II), the process comprising: introducing (II) into a liquid reaction medium within an ORZ, the liquid reaction medium comprising (I) and having a particulate HC for the oxidation reaction suspended in it; introducing an oxidizing agent into the ORZ; continuously oxidizing (II) in the liquid reaction medium within the ORZ to form (I); continuously withdrawing a reaction mixture effluent from the ORZ, the reaction mixture effluent comprising (I); continuously separating the PC from the reaction mixture effluent to form a catalyst recycle stream comprising the separated catalyst; and introducing at least a portion of the PC contained in the catalyst recycle stream into the ORZ. Preferably, the PC contained in the catalyst recycle stream passes through at least one other ORZ before being introduced into the ORZ. The PC contained in the catalyst recycle stream is introduced directly into the ORZ. The PC is separated from the reaction mixture effluent in a catalyst filter to form the catalyst recycle stream and a filtrate free of the PC and comprising (I). The catalyst filter is adapted for continuous separation of the PC from the reaction mixture effluent.

In (C4), preparing (I) comprises oxidizing (II) in a reactor system, the process comprising:
introducing an AFS comprising (II) into a first ORZ;
introducing an oxidizing agent into the first ORZ;
continuously oxidizing (II) in the first ORZ to form (I); continuously withdrawing an intermediate reaction mixture effluent comprising (I) and unreacted (II) from the first ORZ; continuously introducing an intermediate AFS into a second ORZ, the intermediate AFS comprising (I) and unreacted (II) obtained in the intermediate reaction mixture effluent; introducing an oxidizing agent into the second ORZ, continuously oxidizing (II), in the second ORZ to form additional (I); and continuously withdrawing a reaction mixture effluent comprising (I) from the second ORZ. The first and second ORZs contain a catalyst for the oxidation reaction . The catalyst in the first oxidation,reaction zone is a heterogeneous PC and is suspended in a liquid reaction medium comprising (II). The first ORZ is back-mixed in the liquid phase. The first ORZ is provided by a stirred tank reactor, an ejector nozzle loop reactor or a fluidized bed reactor. The second ORZ is provided by a fixed bed having the catalyst in it. The first and second ORZs are back-mixed in the liquid phase. The oxidizing agent introduced into the first and second ORZs is OG and the second ORZ is back-mixed in the gas phase. The first and second ORZs are provided by first and second continuous stirred tank reactors respectively, the stirred tank reactors containing a headspace above the liquid

reaction medium, the second stirred tank reactor being provided with an impeller system adapted to draw gas from the headspace into the liquid reaction medium, thereby reducing the difference between the oxygen partial pressure of the gas being drawn into the liquid reaction medium and the oxygen partial pressure of the headspace gas. OG is introduced into the headspace above the liquid reaction medium within the second stirred tank reactor. The first ORZ is provided by a continuous stirred tank reactor and the second ORZ is provided by an ejector nozzle loop reactor. Oxidation reaction zones are provided by first and second continuous stirred tank reactors respectively. The reaction mixture effluent withdrawn from the second ORZ further comprises the PC, the process further comprising separating the participate catalyst from the reaction mixture effluent withdrawn from the second ORZ to form a catalyst recycle stream comprising the separated catalyst. The process further comprises introducing at least a portion of the PC contained in the catalyst recycle stream into at least one of the first and second ORZs. The PC is separated from the reaction mixture effluent in a catalyst filter to form the catalyst recycle stream and a filtrate, free of the PC and comprising (I). The catalyst filter is adapted for continuous separation of PC from the reaction mixture. At least a portion of the PC contained in the catalyst recycle stream passes through a catalyst holding tank before being introduced into at least one of the first and second ORZs. The catalyst holding tank is free of O2. The process further comprises introducing a non-oxidizing gas into the catalyst holding tank. The residence time of the recycled catalyst in the catalyst holding tank is at least 2 minutes. At least a portion of the PC contained in the catalyst recycle stream is introduced into the first ORZ concurrently with (II). At least a portion of the PC contained in the catalyst recycle stream may also be introduced into the second ORZ concurrently with the unreacted (II) obtained in the intermediate aqueous reaction mixture effluent. A portion of the participate catalyst contained in the catalyst recycle stream may be introduced into the first ORZ concurrently with (II) and another portion of the PC contained in the catalyst recycle stream is introduced into the second ORZ concurrently with the unreacted (II) obtained in the intermediate aqueous reaction mixture effluent. The catalyst is purged from the catalyst recycle stream. Fresh catalyst is added to the catalyst recycle stream. The intermediate reaction mixture effluent withdrawn from the first ORZ further comprises the PC. The intermediate AFS introduced into the second ORZ further comprises PC obtained in the intermediate reaction mixture effluent. The process further comprises separating the PC from the intermediate reaction mixture effluent withdrawn from the first ORZ to form a catalyst recycle stream comprising the separated catalyst; and introducing at least a portion of the PC contained in the catalyst recycle stream into the first ORZ concurrently with (II). The PC is separated from the intermediate reaction mixture affluent in a catalyst filter to form the catalyst recycle stream and a filtrate free of the PC and comprising (I) and the intermediate

AFS introduced into the second ORZ comprises the filtrate. The reaction mixture effluent withdrawn from the second ORZ further comprises the PC, the process further comprising separating the PC from the reaction mixture effluent withdrawn from the second ORZ to form a second catalyst recycle stream comprising the separated catalyst. The PC is separated from the reaction mixture effluent in a second catalyst filter to form the second catalyst recycle stream and a second filtrate free of the PC and comprising (I). The process further comprising introducing at least a portion of the PC contained in the second catalyst recycle stream into at least one of the first and second ORZs. At least a portion of the PC contained in the second catalyst recycle stream is introduced into the second ORZ concurrently with the unreacted (II) obtained in the intermediate reaction mixture effluent. The average age of the catalyst in the first ORZ is different from the average age of the catalyst in the second ORZ. The average age of the catalyst in the first ORZ is greater than the average age of the catalyst in the second ORZ. The average age of the catalyst in the first ORZ is less than the average age of the catalyst in the second ORZ. The catalyst filters are adapted for continuous separation of PC from the intermediate reaction mixture effluent and the reaction mixture effluent. The process further comprises cooling the liquid reaction medium in the first ORZ. The liquid reaction medium in the first ORZ is cooled in an external heat transfer recirculation loop comprising a heat exchanger associated with the first stirred tank reactor. The second ORZ, is operated adiabatically. The process further comprises cooling the liquid reaction medium in the second ORZ. The liquid reaction medium in the second ORZ is cooled in an external heat transfer recirculation loop comprising a heat exchanger associated with the tank reactor. The temperature of the liquid reaction medium in the first ORZ is maintained at 95-105 and the temperature of the liquid reaction medium in the second ORZ is maintained at 100-105 degreesC. The concentration of (II) in the AFS is 7-15 weight%. The oxidizing agent is an OG and OG is sparged into the liquid reaction medium within the first and second ORZs. The total oxygen introduced into the first and second ORZs combined is 0.5-5 (preferably 1-3, especially 1.5-2.5) moles of O2 per mole of (II) in the AFS introduced into the first stirred tank reactor. (II) concentration in effluent withdrawn from the second stirred tank reactor is 200-2000 (preferably 500-1500, especially 500-700) ppm by weight. Conversion of (II) to (I) in the first ORZ is at least 70 (preferably 80-95) %. 70-90% of the total oxygen introduced into the first and second ORZs is introduced into the first stirred tank reactor . OG is introduced into the first or second ORZ at a rate such that at least 60 (preferably at least 80, especially at least 90) % of the O2 is utilized in the first or second ORZ. The ratio of the working volume of liquid reaction medium in the first stirred tank reactor to the working volume of liquid reaction medium in the second stirred tank reactor is greater than 1 (preferably 1.1-5). The residence time in the first stirred tank reactor is 10-30 minutes. The residence time in the second stirred tank reactor is 6-20 minutes. The PC further comprises a catalyst-surface promoter in a proportion of at least 0.05 weight% of the catalyst. The

process further comprises introducing a supplemental promoter (SP) into the reactor system and mixing it with the PC. SP is introduced into the liquid reaction medium within at least one of the ORZs, preferably the first ORZ. SP is introduced into the reactor system continuously or intermittently. SP introduced into the reactor system increases the activity and/or selectivity of the PC for oxidizing formaldehyde or formic acid generated during the oxidation of (II). SP introduced into the reactor system increases the activity and/or selectivity of the catalyst for oxidizing (II) to form (I). SP reduces NM leaching from the carbon support.

In (C5), preparation of (I) comprises introducing an aqueous FM comprising (I) into a liquid reaction medium; catalytically oxidizing (II) in the aqueous liquid reaction medium thereby producing a reaction mixture comprising (I); cooling a primary crystallization FM comprising (I) produced in the reaction mixture, thereby precipitating (I) and producing a PML comprising (I); separating precipitated (I) from the PML, and recycling PML and introducing it into the liquid reaction medium where (II) is oxidized to (I). The reaction mixture is divided into a PF and a SF, the primary crystallization FM comprising (I) obtained in the PF. (I) is crystallized from a secondary crystallization FM comprising (I) obtained in the SF, thereby producing a SML comprising (I) and by-products of the oxidation reaction. An aqueous secondary reactor FM, comprising (I) obtained in the SF and unreacted (II) contained in it, is introduced into a secondary oxidation zone where unreacted (II) is oxidized to produce a secondary oxidation reaction mixture containing additional (I), the secondary crystallizer mixture comprising the secondary oxidation reaction mixture. The secondary oxidation zone comprises a fixed bed containing a catalyst for the oxidation. Crystallization of (I) from the primary crystallization FM comprises evaporative, cooling of the primary FM. Water constituting 5-30% by weight of the primary crystallization FM is removed in evaporative cooling of it. The evaporative cooling is conducted adiabatically. Crystallization of (I) from the secondary crystallization FM comprises heat-driven evaporative crystallization. (II) is oxidized in the aqueous liquid reaction medium in a primary ORZ, thereby producing a primary oxidation product, the process further comprising dividing the primary oxidation product into a finishing reaction FM and a primary crystallization fraction, the aqueous crystallization FM comprising the primary crystallization fraction; introducing the finishing reaction FM into a finishing reaction zone; and catalytically oxidizing residual (II) contained in the finishing reaction FM to (I) to produce a finished reaction mixture. The primary oxidation product contains 0.5-2% by weight unreacted (II). A secondary crystallizer FM comprising (I) obtained in the finished reaction mixture is subjected to heat-driven evaporative crystallization, thereby precipitating (I) and producing a SML comprising (I) and by-products of the oxidation of (II). (II) is continuously oxidized in the presence of a NM an carbon catalyst.

In (C6), preparation of (I) comprises introducing an aqueous FM comprising (II) into a catalytic reactor system comprising one or more catalytic reaction zones; catalytically oxidizing to (II) in the

catalytic reactor system to produce a product mixture; dividing the product mixture into a PF and a SF; crystallizing (I) from the PF to produce a solid (I) fraction and a PML; recycling PML for use as a source of water in the preparation of the FM. All of the PML is recycled as a source of water in the preparation of the FM. (I) is crystallized from the PF by evaporative crystallization. Additional (I) is crystallized from the SF, thereby producing a SML. (I) is crystallized from the SF by evaporative crystallization. (I) is crystallized from the PF by adiabatic evaporative crystallization. The FM is continuously introduced into the reactor system, a reaction zone within the system being back-mixed with respect to the liquid phase therein, the exothermic heat of reaction serving to heat the contents of the FM to the reaction temperature prevailing in the back-mixed reaction zone. (II) is oxidized in the presence of HC comprising an NM. A fraction of the NM is leached from the catalyst in the catalytic ORS. Leached NM contained in the PF is returned to the catalytic reactor system in the PML. Leached NM contained in the recycle PML inhibits further leaching of NM from the catalyst in the catalytic reactor system. A portion of leached NM contained in the recycle ML is redeposited on the surface of the HC in the catalytic reactor system.

In (C6), catalytic oxidation of (II) to produce an (I) comprises introducing an AFS comprising (II) into the first of a series of ORZs, each of the series of ORZs comprising an OC; oxidizing (II) in the first ORZs to produce an intermediate oxidation reaction product; introducing the intermediate oxidation reaction product into a second ORZ comprising a fixed bed:containing a NM on carbon catalyst; and oxidizing by-product formaldehyde and/or formic acid in the second reaction zone. The first and second ORZs comprise continuous ORZs, the AFS being continuously or intermittently introduced into the first ORZ, the intermediate oxidation product being continuously or intermittently withdrawn from the first ORZ and continuously or intermittently introduced into the second ORZ. The intermediate oxidation reaction product is cooled prior to being introduced into the second ORZ. Each of the ORZs comprises a fixed bed containing a catalyst for the oxidation of (II) to (I), each except the last of the series producing an intermediate reaction product which is introduced into the next succeeding ORZ in the series, and a final reaction product comprising (I) being withdrawn from the last of the ORZs. The series comprise more than two ORZs, the, intermediate reaction mixture exiting each of the first two of the ORZs being cooled before being introduced into the next succeeding ORZ. The intermediate reaction mixture is cooled before being introduced into the next succeeding ORZ. The aqueous FM contains at least 15 weight% of a water-soluble salt of N-(phosphonomethyl)iminodiacetic acid on an acid equivalent basis and the final reaction mixture contains at least 12 weight% by weight of a water-soluble salt of N-(phosphonomethyl)glycine on an acid equivalent basis. The aqueous FM contains at least 25 (preferably 35) weight% of a water-soluble salt of N-(phosphonomethyl)iminodiacetic acid on an acid equivalent basis and the final oxidation reaction mixture contains at least 28 weight% of a water-soluble salt of N-(phosphonomethyl)glycine on an acid equivalent basis. A final oxidation reaction is

concentrated by removal of water from it. The final reaction mixture is introduced into a flash EV where the pressure is lower than the vapor pressure of the final oxidation mixture at the temperature at which it exits the last of the series of reactors. The first ORZ comprises a back-mixed ORZ within a continuous stirred tank reactor.

INORGANIC CHEMISTRY - Preferred Catalyst: In (A), the OC is in contact with a liquid reaction medium in each of the ORZs. The OC comprises a heterogeneous PC. The heterogeneous PC comprises a NM deposited on a particulate carbon support. In (C2), the catalyst comprises a heterogeneous PC suspended in the liquid reaction medium within the ORZ, the catalyst comprising a NM deposited on a particulate carbon support. In (C2) and (C4), the particulate carbon support exhibits a particle size distribution such that 95% of the catalyst particles are 3-100 microm in their largest dimension. The average particle size of the PC is 15-40 microm. In (C4): the catalyst in the first and second ORZs is a heterogeneous PC and is suspended in a liquid reaction medium comprising (II). The concentration of the PC within the first and second ORZs is 0.1-10 weight% based on the total weight of catalyst and the liquid reaction medium in the ORZs. In (C6), the catalyst for the reaction comprises a NM and is effective to oxidize 1C by-products selected from formaldehyde and formic acid, the oxidation of the 1C by-products further contributing to heating the contents of the FM. In (E5), the catalyst comprises platinum on carbon and the platinum loading on the catalyst is less than 70% of the loading required to provide equivalent productivity in Ibs. of (I) per hour per pound of catalyst at the same temperature in continuous stirred tank reactor utilizing a platinum on carbon a slurry catalyst. Preferably, the catalyst in (E5) comprises a platinum on carbon catalyst containing less than 3 weight% platinum. In (E7), the catalyst comprises a platinum on carbon catalyst comprising not greater than 3% platinum on a total catalyst basis.

Preferred Catalyst Filter: In (C2), the catalyst filter is a continuous cross-flow filter. In (C2) and (C4), the catalyst filter is a continuous back-pulse filter. The back-pulse filter comprises a filter element and a portion of the filtrate is used to back-pulse the filter element and remove separated catalyst from the filter element.

Preferred Promoters: The catalyst-surface promoter comprises Bi, Sn, Cd, Mg, Mn, Ni, Al, Co, Pb, Ti, Sb, Se, Fe, Re, Zn, Ce, Zr, Te or Ge. SP comprises Bi, Pb, Ge, Te, Ti, Cu and/or Ni, especially Bi. SP introduced into the reactor system is in the form of Bi oxide, Bi hydroxide, Bi chloride, Bi bromide, Bi iodide, Bi sulfide, Bi selenide, Bi telluride, Bi sulfite, Bi sulfate, bismuthyl sulfate, bismuthyl nitrite, Bi nitrate, bisrmuthyl nitrate, double nitrate of Bi and Mg, Bi phosphite, Bi phosphate, Bi pyrophosphate, bismuthyl carbonate, Bi perchlorate, Bi antimonate, Bi arsenate, Bi selenite, Bi titrate, Bi vanadate, Bi niobate, Bi tantalate, Bi chromate, bismuthyl dichromate, bismuthyl chromate, double chromate of bismuthyl and potassium, Bi molybdate, double molybdate of Bi and sodium, Bi tungstate, bismuth permanganate, Bi zirconate, Bi acetate, bismuthyl propionate, Bi benzoate, bismuthyl salicylate, Bi oxalate, Bi tartrate, Bi lactate, Bi citrate, Bi gallate, Bi pyrogallate, Bi phosphide, Bi arsenide, sodium bismuthate, bismuth-thiocyanic acid, sodium salt of Bi-thiocyanic acid, K salt of Bi-thiocyanic acid, trimethylbismuthine, triphenylbismuthine, Bi oxychloride, or Bi oxyiodide. Especially SP introduced into the reactor system is in the form of Bi oxide, particularly Bi_2O_3.

EXTENSION ABSTRACT:

EXAMPLE - This example demonstrated the continuous oxidation of N-(phosphonomethyl)iminodiacetic acid (NPMIDA) to glyphosate in the presence of a Pt/Sn/C heterogeneous PC. The experiment was designed to simulate reaction conditions that might prevail in a first stirred tank reaction zone of a continuous reactor system. The experiment was conducted in continuous reactor system and 1000 ml Hastelloy C autoclave was used. The reactor was equipped with an agitator having a 1.25 inch diameter radial six-blade turbine impeller. The liquid level in the reactor was monitored using a level indicator. An internal cooling coil was utilized to control the temperature within the reactor during the course of the reaction. The reactor was continuously fed a gaseous stream of oxygen and an aqueous slurry feed material containing NPMIDA. The oxygen was introduced into the reaction medium through a frit located near the impeller. A liquid product stream containing glyphosate product was continuously withdrawn from the reactor through a frit, which allowed any catalyst charged to the reactor to remain in the reaction medium. The withdrawn liquid product stream was then mixed in-line with a basic solution capable of dissolving glyphosate. The product gas stream (containing CO2 and unreacted oxygen) was continuously vented from the reactor headspace. - The aqueous slurry feed material comprised NPMIDA (7.7 weight%), formaldehyde (3000 ppm by weight) and formic acid (about 6100 ppm by weight). The catalyst comprised platinum (5% by weight) and tin (1.0% by weight) on a particulate carbon support. The continuous reactor was started in batch mode with liquid flow through the system initiated shortly afterwards. The operating conditions were as follows: catalyst concentration in reactor (1 weight%); agitator RPM (1000); liquid flow (30.8 ml/minute); pressure (100 psig); oxygen flow rate (647 sccm); temperature (100 degreesC); reaction mass (725 mg) and impeller type (radial (1.25 '').
The concentration of NPMIDA in the feed composition was 7.73 weight% and 0 weight% glyphosate. After 2.5 hours had elapsed, the reactor outlet contained 0.97 weight% NPMIDA and 6.50 weight% glyphosate.

FILE SEGMENT: CPI
MANUAL CODE: CPI: C05-B01G; C14-V03A; N02-F01

L44 ANSWER 3 OF 17 WPIX
ACCESSION NUMBER: 2001-565075 [63] WPIX
DOC. NO. CPI: C2001-167598 [63]
TITLE: Production of phenol and acetone from cumene hydroperoxide uses reactive distillation and involves exothermic decomposition of diluted cumene hydroperoxide at catalyst bed of reaction distillation column
DERWENT CLASS: A41; E14
INVENTOR: LEVIN D; SANTIESTEBAN J; SANTIESTEBAN J G; SANTIESTEBAN G
PATENT ASSIGNEE: (ESSO-C) EXXON MOBIL OIL CORP; (ESSO-C) EXXONMOBIL CHEM PATENTS INC; (ESSO-C) EXXONMOBIL OIL CORP; (LEVI-I) LEVIN D; (MOBI-C) MOBIL OIL CORP; (SANT-I) SANTIESTEBAN J G
COUNTRY COUNT: 90

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC

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WO 2001046102   A1 20010628 (200163)* EN  25[3]
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AU 2001024477   A  20010703 (200164)  EN
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US 20020058845  A1 20020516 (200237)  EN
      <--
US 6410804      B1 20020625 (200246)  EN
      <--
US 6441252      B1 20020827 (200259)  EN
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EP 1242348      A1 20020925 (200271)  EN
      <--
JP 2003518047   W  20030603 (200346)  JA  34
EP 1242348      B1 20060628 (200643)  EN
DE 60029132     E  20060810 (200654)  DE
DE 60029132     T2 20061221 (200702)  DE
ES 2267600      T3 20070316 (200722)  ES
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APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 2001046102	A1	WO 2000-US34843	20001220
US 20020058845	A1 Div Ex	US 1999-468465	19991221
US 6410804	B1	US 1999-468465	19991221
US 6441252	B1 Div Ex	US 1999-468465	19991221
DE 60029132	E	DE 2000-629132	20001220
DE 60029132	T2	DE 2000-629132	20001220
EP 1242348	A1	EP 2000-988249	20001220
EP 1242348	B1	EP 2000-988249	20001220
DE 60029132	E	EP 2000-988249	20001220
DE 60029132	T2	EP 2000-988249	20001220
EP 1242348	A1	WO 2000-US34843	20001220
JP 2003518047	W	WO 2000-US34843	20001220
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US 20020058845	A1	US 2001-991831	20011114
US 6441252	B1	US 2001-991831	20011114
ES 2267600	T3	EP 2000-988249	20001220

FILING DETAILS:

PATENT NO	KIND		PATENT NO	
DE 60029132	E	Based on	EP 1242348	A
DE 60029132	T2	Based on	EP 1242348	A
AU 2001024477	A	Based on	WO 2001046102	A
EP 1242348	A1	Based on	WO 2001046102	A
JP 2003518047	W	Based on	WO 2001046102	A
EP 1242348	B1	Based on	WO 2001046102	A
DE 60029132	E	Based on	WO 2001046102	A
DE 60029132	T2	Based on	WO 2001046102	A
ES 2267600	T3	Based on	EP 1242348	A

PRIORITY APPLN. INFO: US 1999-468465 19991221
US 2001-991831 20011114

INT. PATENT CLASSIF.:

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                    C07C0039-00 [I,C]; C07C0039-04 [I,A]; C07C0039-04
                    [I,A]; C07C0045-00 [I,C];
                    C07C0045-00 [I,C]; C07C0045-53
                    [I,A]; C07C0045-53 [I,A]; C07C0049-00 [I,C]
                    ; C07C0049-00 [I,C]; C07C0049-08 [I,A]; C07C0049-08
                    [I,A]
 IPC RECLASSIF.:    B01D0003-14 [I,A]; B01D0003-14 [I,C]; B01D0003-32
                    [I,A]; C07B0061-00 [I,A]; C07B0061-00 [I,C];
                    C07C0027-00 [I,C]; C07C0027-12 [I,A]; C07C0037-00
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                    C07C0039-00 [I,C]; C07C0039-04 [I,A];
                    C07C0045-00 [I,C]; C07C0045-53
                    [I,A]; C07C0045-82 [I,A]; C07C0049-00 [I,C]
                    ; C07C0049-08 [I,A]
ECLA:               C07C0037-08; C07C0045-53+49/08
USCLASS NCLM:       568/385.000
        NCLS:       568/768.000
JAP. PATENT CLASSIF.:
      MAIN/SEC.:    B01D0003-14 A; B01D0003-32 Z; C07B0061-00 300;
                    C07C0027-12 350; C07C0037-08; C07C0037-74;
                    C07C0039-04; C07C0045-53; C07C0045-82; C07C0049-08 A
         MAIN:      C07C0027-12 350
      SECONDARY:    B01D0003-14 A; B01D0003-32 Z; C07C0037-08;
                    C07C0037-74; C07C0039-04; C07C0045-53; C07C0045-82;
                    C07C0049-08 A
     ADDITIONAL:    C07B0061-00 300
FTERM CLASSIF.:     4D076; 4H006; 4H039; 4H006/AA02; 4H006/AA04;
                    4D076/AA07; 4D076/AA16; 4D076/AA24; 4H006/AC42;
                    4H006/AC44; 4H006/AD11; 4H006/BA10; 4H006/BA14;
                    4H006/BA30; 4H006/BA68; 4D076/BB03; 4D076/BB30;
                    4H006/BC18; 4H006/BC50; 4H006/BD70; 4H006/BD81;
                    4H006/BD82; 4H006/BD84; 4H039/CA60; 4H039/CA62;
                    4D076/CB02; 4D076/CB03; 4D076/CB04; 4D076/CD50;
                    4H039/CE50; 4D076/EA03.Z; 4D076/EA04.Z; 4D076/EA12.Z;
                    4D076/EA14.Z; 4D076/FA03; 4D076/FA12; 4D076/FA34;
                    4H006/FE13; 4D076/HA20
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BASIC ABSTRACT:

WO 2001046102 A1 UPAB: 20050526

NOVELTY - A cumene hydroperoxide (CHP) feed (110) is introduced into reactive distillation column (100) containing distillation column and a catalyst bed (130). CHP is diluted with acetone and directed through catalyst bed and exothermic decomposition of CHP is performed. Heavy fraction comprising phenol is withdrawn from bottom of column and vaporized light fraction comprising acetone is condensed for recycling.

DETAILED DESCRIPTION - A method for production of phenol and acetone from cumene hydroperoxide comprises:

(i) introducing cumene hydroperoxide feed into reactive distillation column containing a distillation column at the upper portion and a catalyst bed at the lower portion, at above the catalyst bed;

(ii) mixing a diluting portion of acetone with cumene hydroperoxide and directing the diluted cumene hydroperoxide through catalyst bed and decomposing cumene hydroperoxide exothermically to form a product containing heavy fraction comprising phenol and a vaporized light fraction comprising acetone;

(iii) withdrawing heavy fraction from bottom of column and passing light fraction upward through catalyst bed and at least a portion of the reaction distillation column;

(iv) condensing light fraction to form at least a portion of diluting portion of acetone for subsequent mixing with feed.

A portion of light fraction is optionally withdrawn as over head from column. The steps (i)-(iv) are repeated.

An INDEPENDENT CLAIM is also included for apparatus for preparing phenol from cumene hydroperoxide comprising a reactive distillation column with distillation column and catalyst bed. The lower outlet down streams (140) of the catalyst bed enables removal of high boiling bottom products comprising phenol. An inlet is provided at or near the bottom of distillation column for introducing cumene hydroperoxide feed at a point upstream of catalyst bed. The apparatus further contains an upper outlet (150) for removing low boiling overhead products comprising acetone, a heat exchanger (160) for cooling overhead products and an overhead product receiver (170) for receiving cooled overhead products from heat exchanger. The receiver has an outlet from which overhead products are collected and/or returned to distillation column. An overhead product inlet at the upper portion of column facilitates introduction of overhead products reflux from receiver.

USE - For production of phenol and acetone from cumene hydroperoxide. Phenol is used for production of phenolic resins, bisphenol A and caprolactam.

ADVANTAGE - The process achieves at or near 100% conversion of cumene hydroperoxide at long on-stream times with high selectivity to phenol and acetone and with extremely low coproduction of high boiling impurities such as 4-cumylphenol and 2,4-diphenyl-4-methyl-1-pentene. The process allows efficient use of heat of reaction evolved from decomposition of cumene hydroperoxide to effect separation of low boiling products e.g. acetone from reaction product mixture. Minimizes reboiler use and reduces energy cost while providing higher yields, good product purity and lower capital investment.

DESCRIPTION OF DRAWINGS - The figure is a flow diagram of the process for producing phenol and acetone in which acetone is introduced at the top of the distillation column.

Reactive distillation column (100)
Cumene hydroperoxide feed (110)
Catalyst bed (130)
Lower outlet (140)
Upper outlet (150)
Heat exchanger (160)
Overhead receiver (170)

TECHNOLOGY FOCUS:

CHEMICAL ENGINEERING - Preferred Process: The reflux rate of acetone through the column is set to control dilution of feed. The flow of diluted cumene hydroperoxide through the reactor is maintained at a rate so as to keep the catalyst bed wetted to enable maintenance of catalyst temperature at or near boiling point of liquid to provide isothermal operation. The diluted portion of acetone is added to at least one of (a) upper portion of column, (b) lower portion of column, upstream of catalyst bed and (c) feed prior to its introduction to column. Alternatively, acetone is added directly at one or more locations to the catalyst bed in order to reduce formation of heavy compound having a normal boiling point greater than 182 degreesC. The cumene hydroperoxide is decomposed exothermally at 20-150 degreesC preferably at 40-120 degreesC and at a pressure of atmospheric to 1000 psig preferably atmospheric to 400 psig.

Preferred Apparatus: The catalyst bed comprises a solid acid heterogeneous catalyst. The apparatus further comprises overhead product inlet at the lower portion of column for introducing overhead products from receiver to column at or near inlet for introducing cumene hydroperoxide. An overhead product line recycles overhead products to cumene

hydroperoxide feed upstream of inlet for introducing cumene hydroperoxide. Another overhead product line recycles overhead products to one or more portions of catalyst bed.
The apparatus further comprises a stripping section located beneath catalyst bed.

EXTENSION ABSTRACT:

EXAMPLE - A catalyst was obtained by adding ferrous sulfate solution into zirconium oxychlorate solution followed by addition of ammonium hydroxide, tungsten complex to obtain slurry. The slurry was baked, filtered and dried to obtain catalyst pellets. The pellets were packed into the distillation column to form catalyst bed. A cumene hydroperoxide feed comprising 80 weight% cumene hydroperoxide was introduced into the distillation column above catalyst bed. The feed was mixed with diluting portion of acetone derived from column overhead to provide dilute cumene hydroperoxide mixture which was passed through catalyst bed at 50-90 degreesC, pressure of 0-10 psig. A product comprising phenol and acetone was formed. The overhead products and the bottom products were recovered from the column and analyzed. The overhead product contained 99.57% acetone and 0.43% water. The bottom product contained 8.43% acetone, 67.67% phenol, 10.26% cumene, 9.47% alpha-methyl styrene, 2.92% acetophenone and 1.25% water.

FILE SEGMENT: CPI
MANUAL CODE: CPI: A01-E10; A01-E13; E10-E02B1; E10-F02B; N03-B02; N03-C02; N06

L44 ANSWER 4 OF 17 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 2001-502619 [55] WPIX
CROSS REFERENCE: 2001-502618; 2001-565177
DOC. NO. CPI: C2001-151184 [55]
DOC. NO. NON-CPI: N2001-372750 [55]
TITLE: Reactor for rapid conversion of fluid reactants includes heat exchange mechanism formed from superposed metal plates in which fluid flow channels have been formed, and channel-bearing plates aligned during superposition
DERWENT CLASS: E19; E35; J04; Q78
INVENTOR: JOHNSTON A; LEVY W
PATENT ASSIGNEE: (MEGG-N) MEGGITT UK LTD
COUNTRY COUNT: 93

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
WO 2001054806 <--	A1	20010802	(200155)*	EN	29[4]	
AU 2001028642 <--	A	20010807	(200174)	EN		
US 20020018739 <--	A1	20020214	(200214)	EN		
EP 1251951 <--	A1	20021030	(200279)	EN		
JP 2003520673	W	20030708	(200347)	JA	30	
EP 1251951	B1	20041229	(200502)	EN		
DE 60108071	E	20050203	(200510)	DE		
DE 60108071	T2	20050602	(200537)	DE		
ES 2234848	T3	20050701	(200545)	ES		

US 7033553 B2 20060425 (200628) EN

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 2001054806	A1	WO 2001-GB258	20010124
US 20020018739	A1 Provisional	US 2000-184004P	20000222
US 20020018739	A1 Provisional	US 2000-184007P	20000222
AU 2001028642	A	AU 2001-28642	20010124
DE 60108071	E	DE 2001-608071	20010124
DE 60108071	T2	DE 2001-608071	20010124
EP 1251951	A1	EP 2001-946803	20010124
EP 1251951	B1	EP 2001-946803	20010124
DE 60108071	E	EP 2001-946803	20010124
DE 60108071	T2	EP 2001-946803	20010124
ES 2234848	T3	EP 2001-946803	20010124
JP 2003520673	W	JP 2001-554782	20010124
EP 1251951	A1	WO 2001-GB258	20010124
JP 2003520673	W	WO 2001-GB258	20010124
EP 1251951	B1	WO 2001-GB258	20010124
DE 60108071	E	WO 2001-GB258	20010124
DE 60108071	T2	WO 2001-GB258	20010124
US 20020018739	A1	US 2001-769577	20010125
US 7033553	B2 Provisional	US 2000-184007P	20000222
US 7033553	B2	US 2001-769577	20010125

FILING DETAILS:

PATENT NO	KIND		PATENT NO
DE 60108071	E	Based on	EP 1251951 A
DE 60108071	T2	Based on	EP 1251951 A
ES 2234848	T3	Based on	EP 1251951 A
AU 2001028642	A	Based on	WO 2001054806 A
EP 1251951	A1	Based on	WO 2001054806 A
JP 2003520673	W	Based on	WO 2001054806 A
EP 1251951	B1	Based on	WO 2001054806 A
DE 60108071	E	Based on	WO 2001054806 A
DE 60108071	T2	Based on	WO 2001054806 A

PRIORITY APPLN. INFO: GB 2000-17187 20000713
GB 2000-1699 20000125

INT. PATENT CLASSIF.:
MAIN: B01J0008-02
IPC ORIGINAL: F28F0003-08 [I,A]; F28F0003-08 [I,C]
IPC RECLASSIF.: B01J0019-00 [I,A]; B01J0019-00 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-04 [I,A]; B01J0008-04 [I,C]; B01J0008-08 [I,C]; B01J0008-12 [I,A]; C01C0001-00 [I,C]; C01C0001-04 [I,A]; F28D0013-00 [I,A]; F28D0013-00 [I,C]; F28D0009-00 [I,A]; F28D0009-00 [I,C]; F28F0003-00 [I,C]; F28F0003-04 [I,A]; F28F0003-08 [I,A]; F28F0003-08 [I,C]; F28F0009-22 [I,A]; F28F0009-22 [I,C]
ECLA: B01J0008-02B4; B01J0008-02B6; B01J0008-02H; B01J0008-02L; B01J0008-04B4D; B01J0008-04H; B01J0019-00B2; C01C0001-04B4; F28D0009-00B;

F28D0009-00F; F28D0009-00F2; F28D0013-00;
F28F0003-04C; F28F0009-22

ICO: L01J0208:00C2D2F; L01J0208:00C2D4F;
L01J0208:00C2D4F2; L01J0219:00B2D2F; L01J0219:18B

USCLASS NCLM: 422/198.000
NCLS: 422/211.000

JAP. PATENT CLASSIF.:
MAIN/SEC.: B01J0008-02 D; B01J0008-02 Z; B01J0008-04;
B01J0008-12 301; F28F0003-08 301 Z
MAIN: B01J0008-02 Z
SECONDARY: B01J0008-02 D; B01J0008-04; B01J0008-12 301;
F28F0003-08 301 Z

FTERM CLASSIF.: 3L064; 4G070; 4G070/AA01; 4G070/AA03; 4G070/AB05;
4G070/AB06; 4G070/BA01; 4G070/BA08; 4G070/BB06;
4G070/BB08; 4G070/BB21; 4G070/CA25; 4G070/CB02;
4G070/CB17; 4G070/DA23

BASIC ABSTRACT:

WO 2001054806 A1 UPAB: 20060117

NOVELTY - A reactor comprises a reaction zone, and a plate type heat exchange mechanism. The heat exchange mechanism is formed from superposed metal plates in which fluid flow channels have been formed. The channel-bearing plates are aligned during superposition to define discrete heat exchange pathways.

DETAILED DESCRIPTION - A reactor comprises a reaction zone and a plate type heat exchange (5) mechanism in operative contact with the reaction zone, to receive reactants for heat exchange purposes. The heat exchange mechanism is formed from superposed metal plates in which fluid flow channels (3) have been formed, according to a predetermined pattern. The channel-bearing plates are aligned during superposition to define discrete heat exchange pathways (6, 7) for fluid, and diffusion bonded together.

INDEPENDENT CLAIMS are also included for:

(A) a process for conversion of a fluid reactant, comprising providing appropriate fluid reactant species to be converted in the reaction zone, introducing portion(s) of the fluid reactant species into a reactant fluid pathway, and introducing an auxiliary fluid at a temperature differing from that of the fluid reactant species into another fluid pathway and juxtaposed to the first, thus the discrete nature of the respective pathways permits indirect heat exchange between the fluid reactant species; and

(B) a process for indirectly controlling the temperature profile of a reaction fluid in the presence of a catalyst during endothermic or exothermic chemical reaction, comprising passing a reactant fluid from a reactant fluid inlet (2) to a first catalytic bed (4) before passing the reactant fluid through a first channel or set of channels in the printed circuit heat exchanger (PCHE) and subsequently passing the fluid to a further catalytic bed, passing a heat exchanging fluid from a heat exchanging inlet mechanism to a heat exchanging outlet mechanism through a second channel or set of channels in the PCHE, and exchanging heat between the heat exchanging fluid and the reactant fluid while passing through the PCHE, the products of the reaction leaving the catalytic bed which is passed to a reaction fluid outlet mechanism.

USE - For rapid conversion of fluid reactants.

ADVANTAGE - The reactor controls reactant temperature closely with a desired profile, more specifically, aiming to maintain the temperature at a constant level, i.e. to offer attainment of an acceptable approximation to an isothermal reaction zone on an industrial scale.

DESCRIPTION OF DRAWINGS - The figure shows a sectional side view of the reactor.

Fluid inlet (2)

Fluid flow channels (3)

Catalytic bed (4)

Plate type heat exchange (5)
Heat exchange pathways (6, 7) TECHNOLOGY FOCUS:
MECHANICAL ENGINEERING - Preferred Components: The reaction zone comprises catalyst bed(s).

The fluid flow channels are formed by chemically etching or hydraulically milling the channel-bearing plates.

Reaction zones are arranged in succession having a heat exchange panel arranged between each zone.

The panel is 100 mm thick.

The heat exchangers used in the reactor comprise panels that are of the PCHE type.

The catalyst is a spherical body, cylindrical body, hollow body, solid particle, expanded solid, porous solid, wire mesh coated matrix catalyst, woven gauze coated matrix catalyst, or supported catalyst.

A screen restrains catalyst particles from entering the passages of the PCHE.

The heat exchange fluid is a molten salt, molten metal, hot water or other hot liquids, hot gases, stem, superheated steam, chilled liquids and chilled gases, or vaporizing or condensing fluids.

Additional mechanisms providing a moving bed reactor comprise catalyst inlet mechanism, catalyst outlet mechanism, mechanism for feeding new or regenerated catalyst into the catalyst inlet mechanism, and a mechanism to remove catalyst from the catalyst outlet mechanism.

FILE SEGMENT: CPI; GMPI
MANUAL CODE: CPI: E06-A02A; J04-E02; N06

L44 ANSWER 5 OF 17 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 2001-423756 [45] WPIX
DOC. NO. CPI: C2001-128159 [45]
DOC. NO. NON-CPI: N2001-314237 [45]
TITLE: Tubular apparatus for conduction of chemical reactions
DERWENT CLASS: J04; Q78
INVENTOR: DULKINA N A; GOLOVANCHIKOV A B; KADYKOV P A; MAMEDOVA A A; RYABCHUK G V
PATENT ASSIGNEE: (UYVL-R) UNIV VOLG TECH
COUNTRY COUNT: 1

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
RU 2168354 <--	C1	20010610	(200145)*	RU	0[1]	

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
RU 2168354 C1		RU 2000-109745	20000417

PRIORITY APPLN. INFO: RU 2000-109745 20000417
INT. PATENT CLASSIF.:
IPC RECLASSIF.: B01J0008-02 [I,C]; B01J0008-06 [I,A]; F28F0013-00 [I,C]; F28F0013-12 [I,A]
BASIC ABSTRACT:

RU 2168354 C1 UPAB: 20050526

NOVELTY - Tubular apparatus has body inlets and outlets of heat carrier and heat-exchange tubes accommodated in apparatus body and secured in tube plates; and cover with inlets of reaction medium. Said cover forms reaction chamber accommodating activator in form of plate with screw- shaped surface and mounted on shaft end and forming distributing device for uniform supply of reaction medium to heat- exchange tube, together with hydraulic turbine rigidly fastened to shaft ahead of activator. Reaction medium inlets are installed square to blades of hydraulic turbine. Reaction chamber has jacket with additional inlets and outlets of heat carrier.

USE - Devices for conduction of exothermic and endothermic chemical reactions; applicable in chemical and petrochemical industries.

ADVANTAGE - Higher degree of conversion of initial substances into reaction products due to increased residence time and equalization of temperatures profile for anisothermic reactions. 3 dwg

FILE SEGMENT: CPI; GMPI
MANUAL CODE: CPI: J04-X

L44 ANSWER 6 OF 17 WPIX
ACCESSION NUMBER: 1997-118362 [11] WPIX
CROSS REFERENCE: 1995-054175; 1995-066761; 1996-286336; 1998-347226
DOC. NO. CPI: C1997-038217 [11]
TITLE: Process for indirect heat exchange used in catalytic dehydrogenation of hydrocarbon(s) - with reaction fluid channels separated from heat exchange fluid channels by plates with varying heat transfer factor
DERWENT CLASS: E19; H04; J04
INVENTOR: GIROD C J B; LEVY W W; PUJADO P R; ROMATIER J J L; SABIN D J J M; SECHRIST P A
PATENT ASSIGNEE: (UNVO-C) UOP
COUNTRY COUNT: 1

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 5600052 <--	A	19970204	(199711)*	EN	24[15]	

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 5600052 A	CIP of	US 1994-236072	19940502
US 5600052 A		US 1994-365622	19941228

FILING DETAILS:

PATENT NO	KIND	PATENT NO
US 5600052 A	CIP of	US 5525311 A

PRIORITY APPLN. INFO: US 1994-365622 19941228
US 1994-236072 19940502

INT. PATENT CLASSIF.:
IPC RECLASSIF.: B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-04 [I,A]; B01J0008-04 [I,C]; B01J0008-08 [I,A]; B01J0008-08 [I,C];

B01J0008-12 [I,A]; F28D0009-00 [I,A]; F28D0009-00 [I,C]; F28F0027-00 [I,C] ; F28F0027-02 [I,A]; F28F0003-00 [I,C]; F28F0003-04 [I,A]

ECLA: B01J0008-02B; B01J0008-02H; B01J0008-04B; B01J0008-04H; B01J0008-08H; B01J0008-12B; F28D0009-00B; F28F0003-04; F28F0009-02S4B

ICO: L01J0208:00C2D; L01J0208:00C2Z; L01J0208:02A2; L01J0219:24R4B10D; L01J0219:24R4B2; L01J0219:24R4D2B; L01J0219:24R4F2; L01J0219:24R4F4; L01J0219:24R4H; L01J0219:24R4P2D; L01J0219:24R4R6

USCLASS NCLM: 585/654.000

NCLS: 208/133.000; 585/910.000; 585/911.000

BASIC ABSTRACT:

US 5600052 A UPAB: 20050826

Process of indirect heat exchange comprises: (a) passing a heat exchange fluid through a first set of channels formed by one side of plate elements; (b) passing a reaction stream through a second set of channels formed by the second side of the plates and; (c) exchanging heat between the fluid and the reactant stream by contacting the reactant and/or fluid with a first section of the plates having a first heat transfer factor, and a second section of the plates having a second heat transfer factor. The first and second sections are spaced apart with different heat transfer factors. Also claimed is a process for the catalytic dehydrogenation of hydrocarbons which uses the above process.

USE - The process is used for controlling temperature of reactant stream in chemical reaction, especially in catalytic dehydrogenation of hydrocarbons

ADVANTAGE - The process uses an arrangement of heat exchange plates to control temperature conditions by varying heat transfer factor in different parts of a continuous channel. It can be used to operate a reactor under isothermal or other controlled temperature conditions, and a desired temperature profile can be maintained. The process eliminates or minimises step-wise approach to isothermal conditions.

DOCUMENTATION ABSTRACT:

US5600052

Process of indirect heat exchange comprises:

(a) passing a heat exchange fluid through a first set of channels formed by one side of plate elements;

(b) passing a reaction stream through a second set of channels formed by the second side of the plates and;

(c) exchanging heat between the fluid and the reactant stream by contacting the reactant and/or fluid with a first section of the plates having a first heat transfer factor, and a second section of the plates having a second heat transfer factor. The first and second sections are spaced apart with different heat transfer factors.

Also claimed is a process for the catalytic dehydrogenation of hydrocarbons which uses the above process.

USE

The process is used for controlling temperature of reactant stream in chemical reaction, especially in catalytic dehydrogenation of hydrocarbons

ADVANTAGE

The process uses an arrangement of heat exchange plates to control temperature conditions by varying heat transfer factor in different parts of a continuous channel. It can be used to operate a reactor under isothermal or

other controlled temperature conditions, and a desired temperature profile can be
maintained. The process eliminates or minimises step-wise approach to isothermal conditions.

PREFERRED PROCESS

The reaction channels contain a heterogeneous catalyst. The heat exchange fluid passes in the opposite direction to the reactant stream. The heat exchange outlet passes the fluid to a second set of elongated channels, greater in number than the first set.

The reactant stream comprises hydrocarbons. The average temperature of the inlet reactant stream is within 10°F of that at the outlet. The catalytic reaction is endo or exothermic and the average temperature of the inlet reactant stream is lower or higher, respectively, than the average temperature of the outlet reactant stream.

The reaction is a reforming, aromatisation or aromatic alkylation reaction. The catalytic dehydrogenation feedstream comprises 10C+ paraffins. (MHP)

FILE SEGMENT: CPI
MANUAL CODE: CPI: E10-J02C3; H04-E03; J04-E01; N06

L44 ANSWER 7 OF 17 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 1996-498078 [49] WPIX
DOC. NO. CPI: C1996-155717 [49]
TITLE: Formaldehyde synthesis in reduced size reactor, used for production of resins - by heterogeneous exothermic synthesis in high efficiency reactor having adiabatic catalytic beds with cross-flow of reactants and with initial and intermediate injection of methanol and oxygen
DERWENT CLASS: A41; A60; E17
INVENTOR: SIOLI G
PATENT ASSIGNEE: (FLOR-N) FLORIALL HOLDINGS LTD; (METH-N) METHANOL CASALE SA
COUNTRY COUNT: 69

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
ZA 9602804 <--	A	19960925	(199649)*	EN	23[2]	
WO 9632189 <--	A1	19961017	(199649)	EN	26	
AU 9656866 <--	A	19961030	(199708)	EN		
EP 823863 <--	A1	19980218	(199811)	EN		
HU 9802256 <--	A2	19990128	(199912)	HU		
EP 823863 <--	B1	19990303	(199913)	EN		
DE 69601625 <--	E	19990408	(199920)	DE		
ES 2131942 <--	T3	19990801	(199937)	ES		
US 5959154 <--	A	19990928	(199947)	EN		

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AU 712231        B  19991104 (200003)  EN
      <--
MX 9707817       A1 19980801 (200014)  ES
      <--
BR 9604919       A  20000425 (200033)  PT
      <--
RU 2150995       C1 20000620 (200060)  RU
      <--
MX 199401        B  20001103 (200215)  ES
      <--
CN 1184436       A  19980610 (200254)  ZH
      <--
RO 117676        B1 20020628 (200256)  RO
      <--
CN 1101256       C  20030212 (200535)  ZH
CA 2217347       C  20071016 (200770)  EN
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APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
ZA 9602804	A	ZA 1996-2804	19960409
AU 9656866	A	AU 1996-56866	19960409
AU 712231	B	AU 1996-56866	19960409
BR 9604919	A	BR 1996-4919	19960409
CN 1184436	A	CN 1996-193905	19960409
CN 1101256	C	CN 1996-193905	19960409
DE 69601625	E	DE 1996-601625	19960409
EP 823863	A1	EP 1996-914887	19960409
EP 823863	B1	EP 1996-914887	19960409
DE 69601625	E	EP 1996-914887	19960409
ES 2131942	T3	EP 1996-914887	19960409
WO 9632189	A1	WO 1996-EP1516	19960409
EP 823863	A1	WO 1996-EP1516	19960409
HU 9802256	A2	WO 1996-EP1516	19960409
EP 823863	B1	WO 1996-EP1516	19960409
DE 69601625	E	WO 1996-EP1516	19960409
US 5959154	A	WO 1996-EP1516	19960409
BR 9604919	A	WO 1996-EP1516	19960409
RU 2150995	C1	WO 1996-EP1516	19960409
RO 117676	B1	WO 1996-EP1516	19960409
RO 117676	B1	RO 1997-1864	19960409
RU 2150995	C1	RU 1997-118856	19960409
MX 9707817	A1	MX 1997-7817	19971010
MX 199401	B	MX 1997-7817	19971010
US 5959154	A	US 1997-930628	19971201
HU 9802256	A2	HU 1998-2256	19960409
CA 2217347	C	CA 1996-2217347	19960409
CA 2217347	C	WO 1996-EP1516	19960409

FILING DETAILS:

PATENT NO	KIND		PATENT NO	
AU 712231	B	Previous Publ	AU 9656866	A
DE 69601625	E	Based on	EP 823863	A
ES 2131942	T3	Based on	EP 823863	A
AU 9656866	A	Based on	WO 9632189	A
EP 823863	A1	Based on	WO 9632189	A
HU 9802256	A2	Based on	WO 9632189	A

EP 823863	B1	Based on	WO 9632189	A
DE 69601625	E	Based on	WO 9632189	A
US 5959154	A	Based on	WO 9632189	A
AU 712231	B	Based on	WO 9632189	A
BR 9604919	A	Based on	WO 9632189	A
RU 2150995	C1	Based on	WO 9632189	A
RO 117676	B1	Based on	WO 9632189	A
CA 2217347	C	Based on	WO 9632189	A

PRIORITY APPLN. INFO: CH 1995-1042 19950411
WO 1996-EP1516 19960409
INT. PATENT CLASSIF.:
MAIN: B01J0008-04
IPC ORIGINAL: B01J0008-04 [I,A]; B01J0008-04 [I,C]; C07C0045-00 [I,C]; C07C0045-38 [I,A]; C07C0047-02 [I,C]; C07C0047-052 [I,A]
IPC RECLASSIF.: B01J0008-04 [I,A]; B01J0008-04 [I,C]; C07C0045-00 [I,C]; C07C0045-38 [I,A]; C07C0047-02 [I,C]; C07C0047-04 [I,A]
ECLA: B01J0008-04B2D; B01J0008-04H; C07C0045-38+47/04
ICO: L01J0208:00C2D4C
USCLASS NCLM: 568/472.000
NCLS: 029/401.100; 422/196.000; 568/422.000; 568/448.000; 568/487.000
BASIC ABSTRACT:

ZA 9602804 A UPAB: 20060112

A process for formaldehyde synthesis, utilising a reactor containing adiabatic catalytic beds connected in series, comprises: (a) feeding gaseous methanol and excess oxygen to the reactor; and (b) causing the reagents to flow radially across the beds to effect partial oxidation of the methanol.

USE - The formaldehyde prod. can be used directly for the production of resins and intermediate gaseous flows can be used directly as aqueous solns. containing 7-12% methanol which acts as a polymerisation inhibitor.

ADVANTAGE - The process gives increased production capacity, while reducing the risk of explosion, energy consumption and investment costs. High selectivity and optimal utilisation of the catalytic mass are obtd.. The reactor is more compact (e.g. more than 1/2 the size) and simpler than conventional reactors. The catalyst is protected from loss of activity by being kept in the oxidised state. Maintenance, loading and unloading of the catalytic mass is simpler and faster, compared with prior art. (Reissue of the entry advised in week 9643 based on complete specification)

DOCUMENTATION ABSTRACT:

ZA9602804

A process for formaldehyde synthesis, utilising a reactor containing adiabatic catalytic beds connected in series, comprises:

(a) feeding gaseous methanol and excess oxygen to the reactor; and

(b) causing the reagents to flow radially across the beds to effect partial oxidation of the methanol.

USE

The formaldehyde prod. can be used directly for the production of resins and intermediate gaseous flows can be used directly as aqueous solns. containing 7-12% methanol which acts as a polymerisation inhibitor.

ADVANTAGE

The process gives increased production capacity, while reducing the risk of explosion, energy consumption and investment costs. High selectivity and optimal utilisation of the catalytic mass are obtd.. The reactor is more compact (e.g. more than 1/2 the size) and simpler than conventional reactors. The catalyst is protected from loss of activity by being kept in the oxidised state. Maintenance, loading and unloading of the catalytic mass is simpler and faster, compared with prior art.

EXAMPLE

A reactor according to Fig. 1 was compared with a prior art reactor. The conventional reactor had a shell internal diameter of 3 m with a total height of 20 m and the new reactor had a shell internal diameter of 2.6 m with a total height of only 8 m. Each reactor has a first 13001 bed, a second 1400 1 bed, a 1600 1 third bed and a fourth 2800 1 catalyst bed. The reactors were operated at 1.3 atmos., 230 ° C catalyst bed inlet temperature, 330 ° C catalyst bed outlet temperature, an MeOH concentration (first bed inlet) of 6.5 volume% and an O2 concentration (first bed inlet) of 8.0 volume%, MeOH was fed to the first catalyst bed of the conventional reactor at 3130 kg/hr. The same amount of MeOH was fed to the first bed of the new reactor, together with a further 750 kg./hr formaldehyde, wile the new reactor produced 2780 kg/hr. formaldehyde (60 kg/hr. (2%) increase) over the conventional reactor but with a great reduction in size. (MB)

PREFERRED REACTOR

The reactor comprises:

(a) a (pref. cylindrical) vertical shell;

(b) catalyst beds superimposed and supported in a mutually spaced relationship in (8),

(c) a distributor (for gaseous or liquid MeOH flow, supported in the shell between at least two of the beds;

(d) more than one of the beds has opposed side walls which are gas permeable and a bottom which is gas impermeable;

(e) a cooling means, pref. a heat exchanger arranged centrally to the reactor and extending along its longitudinal axis; and

(f) a gas outlet duct to extract gases from more than one of the catalytic beds. The heat exchanger is a tube nest or bayonet type, especially tube nest with finned tubes.

PREFERRED PROCESS

The process comprises:

(a) injecting (pref. more than two portions) a gas or liquid flow of O2 into the gas or liquid flow coming from more than one of the catalyst beds;

(b) feeding the resulting flow into a following catalytic bed;

(c) cooling at least part of the hot gas flow from more than one of the catalyst beds; and

(d) extracting from the reactor at least part of a gas flow from more than one of the catalyst beds.

The flow of reactants across the beds is radial, especially axial radial and the radial flow is especially centripetal.

FILE SEGMENT: CPI
MANUAL CODE: CPI: A01-E09; E10-D01C; N06

L44 ANSWER 8 OF 17 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 1996-498077 [49] WPIX
DOC. NO. CPI: C1996-155716 [49]
TITLE: Formaldehyde synthesis, used for production of resins. - by heterogeneous exothermic synthesis in high efficiency reactor having adiabatic catalytic beds with cross-flow of reactants and with initial and intermediate injection of methanol and oxygen
DERWENT CLASS: A41; A60; E17
INVENTOR: SIOLI G
PATENT ASSIGNEE: (FLOR-N) FLORIALL HOLDINGS LTD; (METH-N) METHANOL CASALE SA
COUNTRY COUNT: 70

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
ZA 9602803 <--	A	19960925	(199649)*	EN	28[2]	
WO 9632190 <--	A1	19961017	(199649)	EN	31	
AU 9656867 <--	A	19961030	(199708)	EN		
EP 820345 <--	A1	19980128	(199809)	EN		
HU 9802255 <--	A2	19990128	(199912)	HU		
US 5986146 <--	A	19991116	(200001)	EN		
MX 9707821 <--	A1	19980801	(200014)	ES		
AU 715869 <--	B	20000210	(200018)	EN		
BR 9604918 <--	A	20000425	(200033)	PT		
EP 820345 <--	B1	20000726	(200036)	EN		
DE 69609496 <--	E	20000831	(200050)	DE		
ES 2150124 <--	T3	20001116	(200064)	ES		
RU 2156160 <--	C2	20000920	(200102)	RU		
HU 219832 <--	B	20010828	(200157)	HU		
MX 200851 <--	B	20010214	(200224)	ES		
CN 1184437 <--	A	19980610	(200254)	ZH		
RO 117677 <--	B1	20020628	(200256)	RO		
CN 1082386 <--	C	20020410	(200521)	ZH		
CA 2217521	C	20071016	(200770)	EN		
IN 193887	B	20040828	(200975)#	EN		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
ZA 9602803	A	ZA 1996-2803	19960409
AU 9656867	A	AU 1996-56867	19960409
AU 715869	B	AU 1996-56867	19960409
BR 9604918	A	BR 1996-4918	19960409
CA 2217521	C	CA 1996-2217521	19960409
CN 1184437	A	CN 1996-193906	19960409
CN 1082386	C	CN 1996-193906	19960409
DE 69609496	E 19960409	DE 1996-69609496	
EP 820345	A1	EP 1996-914888	19960409
EP 820345	B1	EP 1996-914888	19960409
DE 69609496	E	EP 1996-914888	19960409
ES 2150124	T3	EP 1996-914888	19960409
WO 9632190	A1	WO 1996-EP1517	19960409
EP 820345	A1	WO 1996-EP1517	19960409
HU 9802255	A2	WO 1996-EP1517	19960409
US 5986146	A	WO 1996-EP1517	19960409
BR 9604918	A	WO 1996-EP1517	19960409
EP 820345	B1	WO 1996-EP1517	19960409
DE 69609496	E	WO 1996-EP1517	19960409
RU 2156160	C2	WO 1996-EP1517	19960409
HU 219832	B	WO 1996-EP1517	19960409
RO 117677	B1	WO 1996-EP1517	19960409
CA 2217521	C	WO 1996-EP1517	19960409
RO 117677	B1	RO 1997-1865	19960409
RU 2156160	C2	RU 1997-118855	19960409
MX 9707821	A1	MX 1997-7821	19971010
MX 200851	B	MX 1997-7821	19971010
US 5986146	A	US 1997-930627	19971205
HU 9802255	A2	HU 1998-2255	19960409
HU 219832	B	HU 1998-2255	19960409
IN 193887	B	IN 1996-CH583	19960408

FILING DETAILS:

PATENT NO	KIND		PATENT NO	
AU 715869	B	Previous Publ	AU 9656867	A
DE 69609496	E	Based on	EP 820345	A
ES 2150124	T3	Based on	EP 820345	A
AU 9656867	A	Based on	WO 9632190	A
EP 820345	A1	Based on	WO 9632190	A
HU 9802255	A2	Based on	WO 9632190	A
US 5986146	A	Based on	WO 9632190	A
AU 715869	B	Based on	WO 9632190	A
BR 9604918	A	Based on	WO 9632190	A
EP 820345	B1	Based on	WO 9632190	A
DE 69609496	E	Based on	WO 9632190	A
RU 2156160	C2	Based on	WO 9632190	A
HU 219832	B	Based on	WO 9632190	A
RO 117677	B1	Based on	WO 9632190	A
CA 2217521	C	Based on	WO 9632190	A

PRIORITY APPLN. INFO: CH 1995-1041 19950411
WO 1996-EP1517 19960409
IN 1996-CH583 19960408

INT. PATENT CLASSIF.:
MAIN: B01J0008-04; C07C0047-04
SECONDARY: B01J0019-26; C07C0045-38
IPC ORIGINAL: B01J0008-04 [I,A]; B01J0008-04 [I,C]; C07C0045-00 [I,C]; C07C0045-38 [I,A]; C07C0047-02 [I,C]; C07C0047-052 [I,A]
IPC RECLASSIF.: B01J0008-04 [I,A]; B01J0008-04 [I,C]; C07C0045-00 [I,C]; C07C0045-38 [I,A]
ECLA: B01J0008-04B2D; B01J0008-04H; C07C0045-38+47/04
ICO: L01J0208:00C2D4C

BASIC ABSTRACT:

ZA 9602803 A UPAB: 20050702

A process for formaldehyde synthesis utilising a reactor (7) containing adiabatic catalytic beds (11a-3) connected in series. The process comprises: (a) feeding gaseous methanol (distributed in less than 2 portions) and excess oxygen to (7); and (b) causing the reagents to flow across (11a-e) to effect partial oxidn.of the methanol.

USE - The formaldehyde prod. can be used directly for the production of resins and intermediate gaseous flows can be used directly as aqueous solns. containing 7-12% methanol which acts as a polymerisation inhibitor.

ADVANTAGE - The process gives increased production capacity (e.g. 23.5% compared with prior art, in examples), while reducing the risk of explosion, energy consumption and investment. High selectivity and optimal utilisation of the catalytic mass are obtd., the reactor is more compact (e.g. reactor volume reduction by a factor of 3) and simpler than conventional reactors and the catalyst is protected from loss of activity by being kept in the oxidised state. Maintenance, loading and unloading of the catalytic mass is simpler and faster, compared with prior art. Catalyst volume are reduced by, e.g. 12%, compared with prior art. (Reissue of the entry advised in week 9643 based on complete specification)

DOCUMENTATION ABSTRACT:

ZA9602803

A process, for formaldehyde synthesis utilising a reactor (7) containing adiabatic catalytic beds (11a-3) connected in series, comprises:

(a) feeding gaseous methanol (distributed in less than 2 portions) and excess oxygen to (7); and

(b) causing the reagents to flow across (11a-e) to effect partial oxidn.of the methanol.

USE

The formaldehyde prod. can be used directly for the production of resins and intermediate gaseous flows can be used directly as aqueous solns. containing 7-12% methanol which acts as a polymerisation inhibitor.

ADVANTAGE

The process gives increased production capacity (e.g. 23.5% compared with prior art, in examples), while reducing the risk of explosion, energy consumption and investment. High selectivity and optimal utilisation of the catalytic mass are obtd., the reactor is more compact (e.g. reactor volume reduction by a factor of 3) and simpler than conventional reactors and the catalyst is protected from loss of activity by being kept in the oxidised state. Maintenance, loading and unloading of the catalytic mass is simpler and faster, compared with prior art. Catalyst volume are reduced by, e.g. 12%, compared with prior art.

EXAMPLE

A reactor according to Fig. 2 was compared with a prior art reactor. Each reactor had a shell internal diameter of 3 m, a total height of 20 m, a volume of 140 m 3 , a first 13001 bed, a second 1400 1 bed, a 1600 1 third bed and a fourth 2800 1 catalyst bed.The reactors were operated at 1.3 atoms., 230 ° C catalyst bed inlet temperature, 330 ° C catalyst bed outlet temperature, an MeOH concentration (first bed inlet) of 6.5 volume% and an O 2 concentration (first bed inlet) of 8.0 volume%. MeOH was fed to the first catalyst bed of the conventional reactor at 3130 kg/hr. The same amount of MeOH was fed to the first bed of the new reactor, together with a further 750 kg/hr. MeOH to the second bed (total 3835 kg/hr.). The conventional reactor produced 2720 kg/hr. formaldehyde, while the new reactor produced 3360 kg/hr. formaldehyde which is an increase of 640 kg/hr. or 23.5% over the conventional reactor.There was also a reduction in energy consumption of 24% /unit prod.. (MB)

PREFERRED REACTOR

The reactor comprises:

(a) a (pref cylindrical) vertical shell (8);

(b) (11a-e) superimposed and supported in a mutually spaced relationship in (8);

(c) a distributor (for gaseous or liquid MeOH flow, supported in (8) between less than 2 of (11a-3);

(d) less than one of (11a-e) has opposed side walls (13, 14) which are gas permeable and a bottom which is gas impermeable;

(e) a cooling means, pref. a heat exchanger (12) arranged centrally to (7) and extending along its longitudinal axis; and

(f) a gas outlet duct to extract gases from less than 1 of (11a-e). (12) is a tube nest or bayonet type, especially tube nest with finned tubes.

PREFERRED PROCESS

The process comprises:

(a) injecting (in pref. less than two portions) a gas or liquid flow of O 2 into the gas or liquid flow coming from less than one of (11ad);

(b) feeding the resulting flow into a following catalytic bed;

(c) cooling at least part of the hot gas flow from less than one of (11a-e) using (12); and

(d) extracting from (7) at least part of a gas flow from less than one of (11a-e).

The flow of reactants across (11a-e) is radial, especially axial-radial and the radial flow is especially centripetal.

FILE SEGMENT: CPI
MANUAL CODE: CPI: A01-E09; E10-D01C; N06

L44 ANSWER 9 OF 17 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 1996-476890 [47] WPIX
DOC. NO. CPI: C1996-148935 [47]
TITLE: Carrying out two chemical reactions in reactor system - in which heat generated in first reactor bed is transferred to second reactor bed, the beds being continuous porous structures
DERWENT CLASS: A41; E19; E36; H04; J04; Q74

INVENTOR: MULDER A; POLMAN E A; VAN DER WAL W J J; VAN WAVEREN A; VAN WINGERDEN A J M; WINGERDEN A J M
PATENT ASSIGNEE: (GAST-N) GASTEC NV
COUNTRY COUNT: 68

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
WO 9632188 <--	A1	19961017	(199647)*	EN	33[2]	
NL 1000146 <--	C2	19961015	(199702)	NL	35[2]	
AU 9651641 <--	A	19961030	(199708)	EN		
EP 869842 <--	A1	19981014	(199845)	EN		
JP 11504563 <--	W	19990427	(199927)	JA	31	
EP 869842 <--	B1	20011010	(200167)	EN		
DE 69615864 <--	E	20011115	(200176)	DE		
US 6482375 <--	B1	20021119	(200280)	EN		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 9632188 A1		WO 1996-NL163	19960412
NL 1000146 C2		NL 1995-1000146	19950413
AU 9651641 A		AU 1996-51641	19960412
DE 69615864 E		DE 1996-69615864	19960412
EP 869842 A1		EP 1996-908396	19960412
EP 869842 B1		EP 1996-908396	19960412
DE 69615864 E		EP 1996-908396	19960412
JP 11504563 W		JP 1996-530921	19960412
EP 869842 A1		WO 1996-NL163	19960412
JP 11504563 W		WO 1996-NL163	19960412
EP 869842 B1		WO 1996-NL163	19960412
DE 69615864 E		WO 1996-NL163	19960412
US 6482375 B1		WO 1996-NL163	19960412
US 6482375 B1		US 1998-930943	19980115

FILING DETAILS:

PATENT NO	KIND	PATENT NO
DE 69615864 E	Based on	EP 869842 A
AU 9651641 A	Based on	WO 9632188 A
EP 869842 A1	Based on	WO 9632188 A
JP 11504563 W	Based on	WO 9632188 A
EP 869842 B1	Based on	WO 9632188 A
DE 69615864 E	Based on	WO 9632188 A
US 6482375 B1	Based on	WO 9632188 A

PRIORITY APPLN. INFO: NL 1995-1000146 19950413
INT. PATENT CLASSIF.:

MAIN: B01J0008-04
IPC RECLASSIF.: B01J0012-00 [I,A]; B01J0012-00 [I,C]; B01J0019-24 [I,A]; B01J0019-24 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-04 [I,A]; B01J0008-04 [I,C]
ECLA: B01J0008-02H; B01J0008-04B4; B01J0008-04B4B; B01J0012-00P; B01J0019-24R2
ICO: L01J0208:00C2D8
USCLASS NCLM: 423/210.000
NCLS: 423/245.100; 423/245.300; 423/651.000; 423/652.000; 423/DIG.006

BASIC ABSTRACT:
WO 1996032188 A1 UPAB: 20050514

Two chemical reactions are carried out in a reactor system consisting of two mutually separate reactor beds, of which the surfaces exposed to the reactants are catalytically active for the chemical reactions, and at least one partition. At least one first reactor bed which is a continuous porous structure is bounded by and fixed to at least one partition. At least one second reactor bed, based on a continuous porous structure, in fixed to the partition on the other side to the first bed. A heat exchanging contact between the beds is present and the reaction heat of the first chemical reaction carried out in the first bed is supplied or absorbed by carrying out a second chemical reaction in the second bed.

USE - For carrying out endothermic and exothermic chemical reactions in a reactor system e.g. methane-steam reforming and dehydrogenation of ethylbenzene to styrene.

ADVANTAGE - The heat conduct of combined endothermic and exothermic reactions to each other can be optimally adjusted. The required heat can be efficiently transported. System has improved stability.

DOCUMENTATION ABSTRACT:
WO9632188

Two chemical reactions are carried out in a reactor system consisting of two mutually separate reactor beds, of which the surfaces exposed to the reactants are catalytically active for the chemical reactions, and at least one partition. At least one first reactor bed which is a continuous porous structure is bounded by and fixed to at least one partition. At least one second reactor bed, based on a continuous porous structure, in fixed to the partition on the other side to the first bed. A heat exchanging contact between the beds is present and the reaction heat of the first chemical reaction carried out in the first bed is supplied or absorbed by carrying out a second chemical reaction in the second bed.

USE

For carrying out endothermic and exothermic chemical reactions in a reactor system e.g. methane-steam reforming and dehydrogenation of ethylbenzene to styrene.

ADVANTAGE

The heat conduct of combined endothermic and exothermic reactions to each other can be optimally adjusted. The required heat can be efficiently transported. System has improved stability.

EXAMPLE

A reactor made of a continuous porous metal structure was used for the catalytic oxidation of methanol into

formaldehyde at 300 rising to 400°C in the first reactor, with 95% conversion. In the second reactor , methanol was reacted with steam at 200 rising to 250°C, with 100% conversion obtd. The heat generated in the first reactor was sufficient for the endothermic reaction in the second reactor.

(KR)

PREFERRED PROCESS

Two or more first reactor beds and/or two or more second reactor beds and a corresp. number of partitions are used. The porous structure is a porous metal, pref. sintered metal particles, sintered metal fibres or metal foam. The reactor beds are formed by a monolith structure of which part of the channels is used as the first reactor bed and part of the second channels is used as the second reactor bed; or are formed by the channels of an assembly of at least two metal plates, where at least one corrugated second plate is attached to a first plate so that longitudinal directional channels are formed between the tops of the corrugated plate and the two surfaces of the first plate. The assembly is pref. rolled up. An endothermic reaction is carried out in the first bed and an exothermic reaction is carried out in the second bed. A multistage reaction is carried out, in which at least one stage has a positive and at least one has a negative heat effect, the stages being carried out in the first and second beds.

FILE SEGMENT: CPI; GMPI
MANUAL CODE: CPI: A01-D03; E10-D01C; E10-J02B3; E31-A01; H04-E03; H04-E04; J04-E01; N06

L44 ANSWER 10 OF 17 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 1996-269782 [28] WPIX
DOC. NO. CPI: C1996-085763 [28]
DOC. NO. NON-CPI: N1996-226738 [28]
TITLE: Catalytic oxidation especially of sulphur di:oxide - carried out in apparatus which minimises pressure drop when heat is carried away from the reaction zone by a heat exchanger tube
DERWENT CLASS: E36; J04; Q78
INVENTOR: DECK H
PATENT ASSIGNEE: (BADI-C) BASF AG
COUNTRY COUNT: 7

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
EP 715886 <--	A1	19960612	(199628)*	DE	9[4]	
DE 4443774 <--	A1	19960613	(199629)	DE	8[4]	

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
EP 715886 A1		EP 1995-119440	19951208
DE 4443774 A1		DE 1994-4443774	19941208

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PRIORITY APPLN. INFO: DE 1994-4443774      19941208
INT. PATENT CLASSIF.:
 IPC RECLASSIF.:      B01J0008-02 [I,A]; B01J0008-02
                      [I,C]; C01B0017-00 [I,C]; C01B0017-80 [I,A];
                      F28D0015-02 [I,A]; F28D0015-02 [I,C]
ECLA:                 B01J0008-02H; C01B0017-80B; F28D0015-02
ICO:                  L01J0208:00C2D2B; L01J0208:00C2D4B
BASIC ABSTRACT:
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EP 715886 A1 UPAB: 20050512

Exothermic reactions occurring in the presence of a catalyst, especially the oxidation of SO2 to SO3, are carried out in an apparatus in which heat from the reaction is brought through a tube out of the reaction zone of the apparatus which contains the catalyst. Also claimed is the apparatus for the process.

USE - For carrying out catalysed exothermic reactions such as the oxidation of SO2 (claimed).

ADVANTAGE - The apparatus is designed to minimise the pressure drop occurring when heat from the reaction is carried away from the catalyst. The process conditions are as isothermal as possible.

DOCUMENTATION ABSTRACT:

EP715886

Exothermic reactions occurring in the presence of a catalyst, especially the oxidation of SO2 to SO3, are carried out in an apparatus in which heat from the reaction is brought through a tube out of the reaction zone of the apparatus which contains the catalyst. Also claimed is the apparatus for the process.

USE

For carrying out catalysed exothermic reactions such as the oxidation of SO2 (claimed).

ADVANTAGE

The apparatus is designed to minimise the pressure drop occurring when heat from the reaction is carried away from the catalyst. The process conditions are as isothermal as possible.

PREFERRED EMBODIMENT

At least 1 heat pipe transports heat from the catalyst material in the reaction zone to one or more of the reactants before they come into contact with the catalyst. The tube is ribbed on its outer surface and contains an alkali metal or Hg or S as heat transfer material.

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FILE SEGMENT:         CPI; GMPI
MANUAL CODE:          CPI: E11-K; E31-F03; J04-E01; J04-E02; N06

L44  ANSWER 11 OF 17  WPIX COPYRIGHT 2010      THOMSON REUTERS on STN
ACCESSION NUMBER:     1995-382443 [49]   WPIX
DOC. NO. CPI:         C1995-165318 [49]
TITLE:                Cumene hydro-peroxide cleavage process  - comprising
                      reacting acidified cumene hydro-peroxide in
                      reflux cooled reactor and transporting
                      inhibited prod. to plug flow reactor
DERWENT CLASS:        A41; E14
INVENTOR:             ALLAN E D; BLACKBOURN R L; LE L B; PATEL S
PATENT ASSIGNEE:      (SHEL-C) SHELL OIL CO
COUNTRY COUNT:        1

PATENT INFORMATION:
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PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 5463136 <--	A	19951031	(199549)*	EN	6[2]	

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 5463136 A		US 1994-363437	19941222

PRIORITY APPLN. INFO: US 1994-363437 19941222
INT. PATENT CLASSIF.:
IPC RECLASSIF.: C07C0001-00 [I,C]; C07C0001-20 [I,A]; C07C0037-00 [I,C]; C07C0037-08 [I,A]; C07C0045-00 [I,C] ; C07C0045-53 [I,A]
ECLA: C07C0001-20+15/44; C07C0037-08; C07C0045-53+49/08
BASIC ABSTRACT:

US 5463136 A UPAB: 20050513

A process for the decomposition of cumene hydroperoxide (CHP) to phenol, acetone and alpha-methylstyrene (AMS) comprises: (a) reacting CHP and sulphuric acid in a reflux-cooled reactor; (b) transporting the reaction prods. under inhibited conditions to a plug-flow reactor; (c) reacting the above reaction prods. in the plug-flow reactor to produce phenol, acetone and AMS and (d) recovering phenol, acetone, AMS or a mixture.

ADVANTAGE - The process is highly selective and productive for phenol, acetone and AMS. Use of a reflux-cooled reactor removes the need for the energy costs of pumping external coolants and the exothermal decomposition reaction remains under control in the event of a local power failure. The inhibition step allows the first reactor prods. to be transported safely and effectively without further reaction taking place to form undesirable by-prods.

DOCUMENTATION ABSTRACT:

US5463136

A process for the decomposition of cumene hydroperoxide (CHP) to phenol, acetone and alpha-methylstyrene (AMS) comprises:

(a) reacting CHP and sulphuric acid in a reflux-cooled reactor;

(b) transporting the reaction prods. under inhibited conditions to a plug-flow reactor;

(c) reacting the above reaction prods. in the plug-flow reactor to produce phenol, acetone and AMS; and

(d) recovering phenol, acetone, AMS or a mixture.

ADVANTAGE

The process is highly selective and productive for phenol, acetone and AMS. Use of a reflux-cooled reactor removes the need for the energy costs of pumping external coolants and the exothermal decomposition reaction remains under control in the event of a local power failure. The inhibition step allows the first reactor prods. to be transported safely and effectively without further reaction taking place to form undesirable by-prods.

EXAMPLE

A CHP feed containing 83.83 weight% CHP was reacted with 200 ppm of H_2SO_4 and 0.5 weight% added water (total 1.448 weight%) at 75 ° C for a 10 min. residence time. 2.5 weight% of acetone was added during transport and the residence time in the second-stage

reactor was 1.5 min.. The plug-flow reactor was run at 127 ° C and the ratio of the amount of heavy components divided by the amount of phenol produced was 0.0695.

A comparative, single-stage run was carried out completing the reaction in the reflux-cooled reactor using 1200 ppm of acid, 0.5 weight% of added water and a residence time of 10 min. at 80 ° C. The ratio of heavy components/phenol was 0.1028.

(JS)

PREFERRED PROCESS

Step (b) is isothermal or accompanied by loss of heat. It may occur through an inhibitive zone comprising a heat exchanger. Part of the prods. from step (a) may be transported through the heat exchanger and then returned to step (a) prod. before it enters the plug-flow reactor. The return pt. is pref. close to the exit pt. from the reflux-cooled reactor.

The transport of the step (a) prods. to the plug-flow reactor may be assisted by a pump. The temp of these prods. at the pump is less than or equal to the temperature at the exit pt. from the reflux-cooled reactor.

A severity inhibitor, pref. up to 3 weight% of water or up to 20 weight% of acetone, may be added to the (recirculated) step (a) prods. The same amount of water or acetone may also be added to the reflux-cooled reactor.

FILE SEGMENT: CPI
MANUAL CODE: CPI: A01-D03; A01-E10; A01-E13; E10-E02B1; E10-F02B; E10-J02C3

L44 ANSWER 12 OF 17 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 1995-154524 [20] WPIX
DOC. NO. CPI: C1995-071191 [20]
DOC. NO. NON-CPI: N1995-121730 [20]
TITLE: Radial flow heat-transfer catalytic reactor - has radial heat-exchange plates that divide heat transfer medium from reaction compartments containing catalysts
DERWENT CLASS: E14; H04; J04; Q78
INVENTOR: KOVES W J
PATENT ASSIGNEE: (UNVO-C) UOP
COUNTRY COUNT: 1

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 5405586 <--	A	19950411	(199520)*	EN	8[3]	

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 5405586 A	CIP of	US 1993-85576	19930701
US 5405586 A		US 1994-269303	19940630

PRIORITY APPLN. INFO: US 1994-269303 19940630
US 1993-85576 19930701
INT. PATENT CLASSIF.:
IPC RECLASSIF.: B01J0008-02 [I,A]; B01J0008-02 [I,C]; F28D0009-00 [I,A];

F28D0009-00 [I,C]
ECLA: B01J0008-02B; B01J0008-02B2; B01J0008-02H; F28D0009-00B; F28D0009-00D2
ICO: L01J0208:00C2D4F; L01J0208:02A2
BASIC ABSTRACT:

US 5405586 A UPAB: 20060109

The improved radial flow heat transfer catalytic reactor gives improved heat transfer in a simple, compact arrangement. In the appts., a stream of reactants is contacted with a catalyst and indirect heat transfer with a heat-exchange medium is used to maintain isothermal conditions. The heat exchange fluid is supplied via an axial channel (18) in a cylindrical reactor vessel. A number of plate heat- exchange elements (48) radiate from the central channel and form a series of interleaved flow channels; those for heat-transfer medium (46) alternate with those (50) in which the reactants and catalysts are contacted. The heat transfer medium is collected in an outer annular chamber (24) surrounding the reactor chamber. The medium flows through inlet (54) and outlet (58) channels in each heat transfer compartment (46).

In each reaction chamber (50), inner (62) and outer (64) web elements define an outer chamber (70) into which the reactants (72) are fed, a central catalyst chamber (68) in which the reaction occurs, and an inner chamber (66) from which the reaction products (78) leave. Flow channels (74, 76) allow the reaction mixture to pass through the system.

Pref. the various sectors, formed by the radial heat- exchange plates, have the same configuration are bonded by the same included angle. Catalyst handling means is provided, to add catalyst to and remove catalyst from the central chambers (68). The heat exchange plates may be corrugated.

USE - Reactor system for isothermal catalysed reactions, e.g. reforming, dehydrogenation, oxygenation, ethylbenzene synthesis.

ADVANTAGE - Gives improved heat transfer and fluid flow in a simple, compact reactor arrangement. Reactor has improved support for heat exchange plates and improved pipework arrangements for reactants and heat transfer medium, but is simple to construct. It can be used for most exothermic and endothermic reactions.

DOCUMENTATION ABSTRACT:

US5405586

The improved radial flow heat transfer catalytic reactor gives improved heat transfer in a simple, compact arrangement.

In the appts., a stream of reactants is contacted with a catalyst and indirect heat transfer with a heat-exchange medium is used to maintain isothermal conditions. The heat exchange fluid is supplied via an axial channel (18) in a cylindrical reactor vessel. A number of plate heat-exchange elements (48) radiate from the central channel and form a series of interleaved flow channels; those for heat-transfer medium (46) alternate with those (50) in which the reactants and catalysts are contacted. The heat transfer medium is collected in an outer annular chamber (24) surrounding the reactor chamber. The medium flows through inlet (54) and outlet (58) channels in each heat transfer compartment (46).

In each reaction chamber (50), inner (62) and outer (64) web elements define an outer chamber (70) into which the reactants (72) are fed, a central catalyst chamber (68) in which the reaction occurs, and an inner chamber (66) from which the reaction products (78) leave. Flow channels (74, 76) allow the reaction mixture to pass through the system.

Pref. the various sectors, formed by the radial heat-

exchange plates, have the same configuration are bonded by the same included angle. Catalyst handling means is provided, to add catalyst to and remove catalyst from the central chambers (68). The heat exchange plates may be corrugated.

USE

Reactor system for isothermal catalysed reactions, e.g. reforming, dehydrogenation, oxygenation, ethylbenzene synthesis.

ADVANTAGE

Gives improved heat transfer and fluid flow in a simple, compact reactor arrangement. Reactor has improved support for heat exchange plates and improved pipework arrangements for reactants and heat transfer medium, but is simple to construct. It can be used for most exothermic and endothermic reactions.(GW)

FILE SEGMENT: CPI; GMPI
MANUAL CODE: CPI: E10-J02B3; H04-E; H04-F02E; J04-E02; N06

L44 ANSWER 13 OF 17 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 1995-054175 [08] WPIX
CROSS REFERENCE: 1997-118362; 1998-347226; 1995-066761; 1996-286336
DOC. NO. CPI: C1995-024601 [08]
DOC. NO. NON-CPI: N1995-042511 [08]
TITLE: Isothermal catalytic reactor with a series of heat exchange zones - each containing grooved sheets connected to fluid circuits containing the reactant and an auxiliary heating or cooling fluid
DERWENT CLASS: J04; Q78
INVENTOR: GIROD C; LEVY W; SABIN D
PATENT ASSIGNEE: (PACK-N) PACKINOX
COUNTRY COUNT: 1

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
FR 2707186 <--	A1	19950113	(199508)*	FR	18[4]	

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
FR 2707186 A1		FR 1993-8210	19930705

PRIORITY APPLN. INFO: FR 1993-8210 19930705
INT. PATENT CLASSIF.:
IPC RECLASSIF.: B01J0019-24 [I,A]; B01J0019-24 [I,C]; B01J0019-32 [I,A]; B01J0019-32 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-04 [I,A]; B01J0008-04 [I,C]; B01J0008-08 [I,A]; B01J0008-08 [I,C]; B01J0008-12 [I,A]; F28D0009-00 [I,A]; F28D0009-00 [I,C]; F28F0003-00 [I,C]; F28F0003-02 [I,A]; F28F0003-04 [I,A]
ECLA: B01J0008-02B; B01J0008-02H; B01J0008-04B; B01J0008-08H; B01J0008-12B; B01J0019-24R4;

B01J0019-32; F28D0009-00B; F28F0003-02D; F28F0003-04

ICO: L01J0208:00C2D2F; L01J0208:02A2; L01J0219:24R4B10D; L01J0219:24R4B2; L01J0219:24R4D2; L01J0219:24R4D2B; L01J0219:24R4F2; L01J0219:24R4F4; L01J0219:24R4H; L01J0219:24R4P2D; L01J0219:24R4R6; L01J0219:322B4; L01J0219:322B8B; L01J0219:324P; L01J0219:324P2; L01J0219:326

BASIC ABSTRACT:

FR 2707186 A1 UPAB: 20050702

Isothermal catalytic reactor for the reaction of a fluid in the presence of a catalyst, maintaining isothermal conditions during the passage of the fluid through the reactor by means of an auxiliary heating fluid. The reactor comprises a stack of parallel sheets (10), each of which has polished edges (11) and a central section (12) which has grooves (13) at an angle to the direction of fluid flow. The sheets are connected to two circuits A and B for the fluids, which flow across and alternating between two adjacent sets of sheets. Circuit A of the reactant fluid contains a catalyst (15) for the reaction.

USE - The isothermal reaction of a fluid in the presence of a catalyst (claimed).

ADVANTAGE - Physico-chemical reactions on an industrial scale need to take place in a given temperature and pressure, as the productivity of the reaction varies significantly with these factors. Many reactions are exothermic or endothermic, but this device allows the temperature to be held constant throughout the reaction process.

DOCUMENTATION ABSTRACT:

FR2707186

Isothermal catalytic reactor for the reaction of a fluid in the presence of a catalyst, maintaining isothermal conditions during the passage of the fluid through the reactor by means of an auxiliary heating fluid.

The reactor comprises a stack of parallel sheets (10), each of which has polished edges (11) and a central section (12) which has grooves (13) at an angle to the direction of fluid flow. The sheets are connected to two circuits A and B for the fluids, which flow across and alternating between two adjacent sets of sheets. Circuit A of the reactant fluid contains a catalyst (15) for the reaction.

USE

The isothermal reaction of a fluid in the presence of a catalyst (claimed).

ADVANTAGE

Physico-chemical reactions on an industrial scale need to take place in a given temperature and pressure, as the productivity of the reaction varies significantly with these factors. Many reactions are exothermic or endothermic, but this device allows the temperature to be held constant throughout the reaction process.

PREFERRED

The means of maintaining isothermal conditions are by separate heat exchange zones (1a, 1b, 1c, 2a...4b, 4c), divided in the divided in the direction of flow of the reactant and/or the auxiliary fluid. the angle of the grooves on the central part of the sheet relative to the reactant flow is different in each zone, and is significant, so a high transfer coefficient is achieved considering the gaps between the sheets and the amount of heat removed in the zones.

Alternatively the angle is small, giving a poor transfer coefficient. The number of sheets is different in each zone, increasing or decreasing from inlet to outlet. The reactor contains means of keeping the catalyst in the pipes containing the reactant. These means comprise grilles in each zone, extending across the whole width of the pipes. The mesh of each grille is smaller than the size of the gains of the catalyst. The auxiliary fluid is a liquid or a gas. (KG)

FILE SEGMENT: CPI; GMPI
MANUAL CODE: CPI: J04-E02; N06-D

L44 ANSWER 14 OF 17 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 1987-292770 [42] WPIX
DOC. NO. CPI: C1987-124294 [21]
TITLE: Tube-cluster reactor for exothermic gas-phase organic reactions - comprises bundles of reaction tubes between trays, with heat-transfer liquid flowing laterally around the tubes
DERWENT CLASS: E14; E17; J04
INVENTOR: AQUILA W; BRENNER K; FUCHS H; HALBRITTER K; RUPPEL W; SCHEIPER H; SCHEIPER H J; WOERZ O
PATENT ASSIGNEE: (BADI-C) BASF AG
COUNTRY COUNT: 11

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
DE 3612213 <--	A	19871015	(198742)*	DE	10[7]	
EP 244632 <--	A	19871111	(198745)	DE		
JP 62244434 <--	A	19871024	(198748)	JA		
IL 82085 <--	A	19900726	(199035)	EN		
EP 244632 <--	B	19910220	(199108)	EN		
DE 3768046 <--	G	19910328	(199114)	DE		
ES 2020214 <--	B	19910801	(199135)	ES		
US 5149884 <--	A	19920922	(199241)	EN	11[7]	
CA 1337355 <--	C	19951017	(199549)	EN		
JP 2513672 <--	B2	19960703	(199631)	JA	8[0]	

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
DE 3612213	A	DE 1986-3612213	19860411
DE 3768046	G	DE 1986-3612213	19860411
EP 244632	A	EP 1987-104722	19870331
US 5149884	A Cont of	US 1987-34940	19870406
CA 1337355	C	CA 1987-534438	19870410
JP 62244434	A	JP 1987-87240	19870410

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      JP 2513672 B2                         JP 1987-87240 19870410
      US 5149884 A Cont of                  US 1989-399353 19890828
      US 5149884 A Cont of                  US 1990-529756 19900529
      US 5149884 A                          US 1991-680631 19910401
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FILING DETAILS:

PATENT NO	KIND	PATENT NO
JP 2513672 B2	Previous Publ	JP 62244434 A

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PRIORITY APPLN. INFO: DE 1986-3612213      19860411
INT. PATENT CLASSIF.:
      MAIN/SEC.:      B01J0012-00; B01J0023-50; C07C0045-29
 IPC RECLASSIF.:      B01J0008-02 [I,C]; B01J0008-06
                      [I,A]; C07B0061-00 [I,A]; C07B0061-00 [I,C];
                      C07C0045-00 [I,A]; C07C0045-00
                      [I,C]; C07C0045-38 [I,A];
                      C07C0045-39 [I,A]; C07C0047-20 [I,C];
                      C07C0047-21 [I,A]; C07C0067-00 [I,A]; C07C0067-00
                      [I,C]
ECLA:                 B01J0008-06H; C07C0045-38; C07C0045-39
ICO:                  L01J0208:00C2D4F; L01J0208:00C2Z
JAP. PATENT CLASSIF.:
      MAIN/SEC.:      B01J0008-06; C07B0061-00 300; C07C0045-00 X;
                      C07C0045-38; C07C0047-21; C07C0067-00 X
FTERM CLASSIF.:       4G070; 4H006; 4H036; 4H039; 4G070/AA01; 4G070/AB04;
                      4H036/AC44; 4H036/AC45; 4H036/BA05; 4G070/BB02;
                      4H006/BB61; 4H036/BB61; 4H006/BC10; 4H036/BC10;
                      4H006/BC13; 4H036/BC13; 4H006/BD81; 4H036/BD81;
                      4H006/BE30; 4H036/BE30; 4G070/CA15; 4G070/CA16;
                      4G070/CA25; 4H039/CA62; 4G070/CB02; 4G070/CB17;
                      4H039/CC20; 4G070/DA21
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BASIC ABSTRACT:

DE 3612213 A UPAB: 20050425

A tube-cluster reactor for catalytic gas-phase organic reactions has reaction tubes of inside dia. 0.5-3 cm, with length:dia. ratio of 2-10, and arranged between tube-trays, with a stream of heat-carrying liquid flowing laterally around the tubes. A process is claimed for the production of aliphatic, aromatic, or araliphatic ketones and aldehydes, by oxidative dehydrogenation of corresp. alcohols with a catalyst containing a Gp. Ib element, in the above reactor.

Tube length is 5-20cm, with pref. inside dia. 1-2cm, liquid heat exchanger is a molten salt, flowing at right angles to the tube axes. The process is partic. applied to the prods. of 3-alkyl-butene-1-als of formula R1R2CH-CHO, by passing a mixture of the corresp. alcohol and oxygen over the catalyst at 300-600 deg.C, and processing the gases as usual after cooling. R1 = H and R2 = CH2=CHMe-, or R1+R2 = Me2C=.

USE/ADVANTAGE - The reactor is useful for exothermic reactions (claimed). It enables extremely exothermic reactions to be carried out in the gas phase with very active, e.g., noble metal, catalysts, with high selectivity.

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FILE SEGMENT:         CPI
MANUAL CODE:          CPI: E10-D01A; E10-D01C; E10-F02A2; J04-E01
                      ; J04-E02; N02-E

L44  ANSWER 15 OF 17  WPIX COPYRIGHT 2010       THOMSON REUTERS on STN
ACCESSION NUMBER:     1985-304836 [49]   WPIX
DOC. NO. CPI:         C1985-131715 [21]
TITLE:                Non-isothermic reactor for mixed
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gas-liquid phase reactions - has improved heat transfer tube arrangement and expanded tubes in upper tube plate to minimise horizontal liquid movement on plate surface

DERWENT CLASS: E17; H04; Q78
INVENTOR: GOUDRIAAN J C; VAN DER BURGT M J; VANDERBURG M J
PATENT ASSIGNEE: (SHEL-C) SHELL INT RES MIJ BV
COUNTRY COUNT: 14

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
EP 163357 <--	A	19851204	(198549)*	EN	12[3]	
GB 2159431 <--	A	19851204	(198549)	EN		
AU 8543034 <--	A	19851205	(198605)	EN		
JP 60257830 <--	A	19851219	(198606)	JA		
ZA 8504032 <--	A	19851129	(198610)	EN		
BR 8502510 <--	A	19860128	(198611)	PT		
ES 8701515 <--	A	19870301	(198715)	ES		
US 4683121 <--	A	19870728	(198732)	EN		
GB 2159431 <--	B	19880427	(198817)	EN		
CA 1249770 <--	A	19890207	(198908)	EN		
EP 163357 <--	B	19890329	(198913)	EN		
DE 3569083 <--	G	19890503	(198919)	DE		
JP 05007059 <--	B	19930128	(199307)	JA	5	

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
EP 163357 A		EP 1985-200845	19850524
GB 2159431 A		GB 1984-13596	19840529
GB 2159431 B		GB 1984-13596	19840529
GB 2159431 A		GB 1984-13956	19840529
US 4683121 A		US 1985-736908	19850522
ES 8701515 A		ES 1985-543550	19850528
JP 60257830 A		JP 1985-113339	19850528
JP 05007059 B		JP 1985-113339	19850528
ZA 8504032 A		ZA 1985-4032	19850528

FILING DETAILS:

PATENT NO	KIND	PATENT NO
JP 05007059 B	Based on	JP 60257830 A

PRIORITY APPLN. INFO: GB 1984-13596 19840529
GB 1984-13956 19840529
INT. PATENT CLASSIF.:
MAIN: B01J0008-06
IPC RECLASSIF.: B01J0019-24 [I,A]; B01J0019-24 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-06 [I,A]; C07C0001-00 [I,A]; C07C0001-00 [I,C]; C07C0001-04 [I,A]; C07C0067-00 [I,A]; C07C0067-00 [I,C]; C10G0002-00 [I,A]; C10G0002-00 [I,C]; F28F0027-00 [I,C]; F28F0027-02 [I,A]
ECLA: B01J0008-06; B01J0019-24J4; C07C0001-04B4; F28F0009-02S6B
ICO: L01J0208:00C2D4F; L01J0208:00C2D4F2
USCLASS NCLM: 422/197.000
NCLS: 422/196.000; 422/311.000
JAP. PATENT CLASSIF.:
MAIN/SEC.: B01J0008-02; B01J0008-02 Z; B01J0008-06; C07C0001-00 X; C07C0001-04; C07C0067-00 X; C10G0002-00
FTERM CLASSIF.: 4G070; 4H006; 4H029; 4H030; 4H129; 4G070/AA01; 4H006/AA02; 4H030/AA02; 4G070/AA03; 4H006/AA04; 4H030/AA04; 4G070/AB07; 4H006/AC29; 4H030/AC29; 4H006/BA82; 4H030/BA82; 4G070/BB02; 4H006/BD81; 4H030/BD81; 4H006/BE20; 4H030/BE20; 4H006/BE40; 4H030/BE40; 4H029/CA00; 4G070/CA06; 4G070/CA09; 4G070/CA12; 4G070/CA15; 4G070/CA18; 4G070/CA25; 4G070/CB02; 4G070/CB17; 4H029/DA00; 4G070/DA22
BASIC ABSTRACT:
EP 163357 A UPAB: 20060105

Reactor suitable for exothermic or endothermic reactions in the mixed gas/liquid phase comprises: (a) normally vertically extending vessel having several parallel tubes filled with catalyst material and extending between upper and lower tube plates; (b) means for circulating a heat transfer medium between the tube plates along the tubes; (c) inlet means above the tubes for distributing liquid in the form of one or more sprays and gas over the several tubes; and (d) outlet means below the several tubes for removal of liquid and gas from the vessel; wherein the several tubes are arranged in rows such that the tubes of adjacent rows are staggered; and the upper tube plate is provided with holes, having a lower part in which the tubes are closely fitted and having a concentric upper part diverging the upper direction, the upper ends of adjacent holes having edges in common in such a manner that the upper end of the upper tube plate is formed by edges arranged in a hexagonal configuration.

USE/ADVANTAGE - The reactor is partic. suitable for exothermic catalytic reactions, such as the synthesis of methanol, where apart from a gas phase a liquid phase is present during the reaction. More especially the reactor is very suitable for the synthesis of hydrocarbons from synthesis gas to form a substitute for petroleum hydrocarbons, where liquid is added to the gaseous feedstock for optimising the process. The staggered configuration of the tubes increases the efficiency of the heat transfer from the catalyst tubes to the heat transfer medium and the expanded ends of the tubes in the top tube plate tends to direct liquid down the tubes rather than across the tube plate since such a large reactor can never be installed sufficiently accurately to have its tube plate truly horizontal.

FILE SEGMENT: CPI; GMPI
MANUAL CODE: CPI: E10-E04E; E10-J02D; E11-K; H04-E05; N06-D

L44 ANSWER 16 OF 17 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 1974-56609V [31] WPIX

TITLE: Catalytic exothermic reaction with fluid reactant stream - has temperature controlled by 2 coolants passed separately through 2 exchangers embedded in the catalyst
DERWENT CLASS: H09
PATENT ASSIGNEE: (TEXC-C) TEXACO INC
COUNTRY COUNT: 1

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 3825501 <--	A	19740723	(197431)*	EN		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 3825501 A		US 1969-880254	19691126
US 3825501 A		US 1971-209238	19711217

PRIORITY APPLN. INFO: US 1971-209238 19711217
US 1969-880254 19691126
INT. PATENT CLASSIF.:
IPC RECLASSIF.: B01J0008-02 [I,A]; B01J0008-02 [I,C]; C01B0003-00 [I,C]; C01B0003-16 [I,A]
ECLA: B01J0008-02H; C01B0003-16+IDT
ICO: L01J0208:00C2D2C
USCLASS NCLM: 252/373.000
NCLS: 422/141.000; 422/146.000; 423/655.000; 423/656.000
BASIC ABSTRACT:

US 3825501 A UPAB: 20051229

Water gas shift reaction at 1350 atmos. is effected in a reactor filled with shift catalyst (e.g. a mixture of 85-95% Fe oxide and 15-5% Cr oxide) and comprising an equilibrium-limited section and an adiabatic section with an inter. isothermal section. A gaseous feed comprising 5-90 mole % CO and H2O is (1) preheated to 380-760 degrees F by passing it as a coolant through a 1st heat-exchange unit embedded in the catalyst in the equilibrium-limited section; (2) the pre-heated feed is partially reacted in the adiabatic section at 300-1100 degrees F to produce H2 and CO2; (3) the partially reacted stream is passed at the same temperature into the isothermal section in which the conversion is continued, an external coolant being passed through a 2nd heat exchange unit embedded in the catalyst in the isothermal section to keep the temperature of the reacting gaseous stream constant in that section; and (4) the partially shifted gas is passed from the isothermal section into the shift catalyst in the equilibrium-limited section to continue the exothermic shift reaction in concurrent flow indirect heat exchange with gaseous feed, the temperature of the reacting gas stream being gradually reduced to 400-780 degrees F at the exit.

FILE SEGMENT: CPI
MANUAL CODE: CPI: H04-E04; H04-E08; H04-E10

L44 ANSWER 17 OF 17 WPIX
ACCESSION NUMBER: 1971-65403S [41] WPIX
TITLE: Heat removal from exothermic reactions incatalyst beds
DERWENT CLASS: A43; E17; J04
PATENT ASSIGNEE: (BADI-C) BADISCHE ANILIN & SODA FAB AG
COUNTRY COUNT: 1

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PATENT INFORMATION:

      PATENT NO      KIND DATE     WEEK      LA  PG          MAIN IPC
      ------------------------------------------------------------------
      GB 1250843      A            (197141)* EN

PRIORITY APPLN. INFO: DE 1968-1642955      19680305
INT. PATENT CLASSIF.:
 IPC RECLASSIF.:      B01J0008-02 [I,A]; B01J0008-02
                      [I,C]; C07C0045-00 [I,C];
                      C07C0045-38 [I,A]
ECLA:                 B01J0008-02H; C07C0045-38+47/04
BASIC ABSTRACT:
           GB 1250843 A   UPAB: 20050413
           In catalyst beds for gaseous reactions, where the gases are passed
     downwards through the bed and its metal support to a cooler, heat withdrawal
     from the bed is improved by using a flexible metal support which is in direct
     contact with a heat exchanger.
           The appts. is specifically for the oxidative dehydrogenation of methanol
     to formaldehyde, where efficient removal of heat from the silver catalyst bed
     improves the yield, and reduces the amount of CO formed.
FILE SEGMENT:         CPI
MANUAL CODE:          CPI: A01-E09; E10-D01; J04-A01


=> D L53 1-2 IFULL

L53  ANSWER 1 OF 2  WPIX COPYRIGHT 2010       THOMSON REUTERS on STN
ACCESSION NUMBER:     2005-180733 [19]   WPIX
CROSS REFERENCE:      2003-670623; 2004-031244; 2004-570533; 2006-512367
DOC. NO. CPI:         C2005-057814 [19]
TITLE:                Manufacture of porous, carbon nanotube-containing
                      structure useful in, e.g. catalysis,
                      involves depositing seed particles on support
                      material, heating support material and exposing
                      seeded support to carbon nanotube precursor gas
DERWENT CLASS:        B04; D16
INVENTOR:             AARDAHL C L; CHIN Y; GAO Y; STEWART T L; WANG Y
PATENT ASSIGNEE:      (AARD-I) AARDAHL C L; (CHIN-I) CHIN Y; (GAOY-I) GAO
                      Y; (STEW-I) STEWART T L; (WANG-I) WANG Y; (BATT-C)
                      BATTELLE MEMORIAL INST
COUNTRY COUNT:        1

PATENT INFORMATION:

      PATENT NO      KIND DATE     WEEK      LA  PG          MAIN IPC
      ------------------------------------------------------------------
      US 20050040090  A1 20050224 (200519)* EN  22[5]
      US 7011760      B2 20060314 (200620)  EN

APPLICATION DETAILS:

      PATENT NO      KIND                  APPLICATION    DATE
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      US 20050040090 A1 CIP of             US 2001-32207 20011221
      US 20050040090 A1 Div Ex             US 2001-36332 20011224
      US 20050040090 A1                    US 2004-956306 20040930

FILING DETAILS:
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PATENT NO         KIND                  PATENT NO
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US 20050040090 A1     CIP of          US 6713519 B
US 20050040090 A1     Div ex          US 6824689 B

PRIORITY APPLN. INFO: US 2004-956306       20040930
                        US 2001-32207        20011221
                        US 2001-36332        20011224
INT. PATENT CLASSIF.:
   IPC ORIGINAL:       B01D0015-00 [I,A]; B01D0015-00 [I,C]
  IPC RECLASSIF.:      B01J0019-00 [I,A]; B01J0019-00
                       [I,C]; B01J0020-20 [I,A]; B01J0020-20 [I,C];
                       B01J0020-30 [I,C]; B01J0020-32 [I,A]; B01J0021-00
                       [I,C]; B01J0021-18 [I,A]; B01J0023-76 [I,C];
                       B01J0023-889 [I,A]; B01J0035-00 [I,C]; B01J0035-04
                       [I,A]; B01J0035-10 [N,A]; B01J0037-00 [I,C];
                       B01J0037-02 [I,A]; B01J0037-03 [N,A]; C01B0031-00
                       [I,C]; C01B0031-02 [I,A]; C04B0041-45 [I,C];
                       C04B0041-52 [I,A]; C04B0041-89 [I,A]; C04B0041-89
                       [I,C]; C10G0002-00 [I,A]; C10G0002-00 [I,C];
                       C23C0026-00 [I,A]; C23C0026-00 [I,C]; C23C0028-00
                       [I,A]; C23C0028-00 [I,C]; C23C0008-02 [I,A];
                       C23C0008-02 [I,C]; C23C0008-80 [I,A]; C23C0008-80
                       [I,C]; F28F0021-00 [I,C]; F28F0021-02 [I,A]
ECLA:                  B01D0069-14B; B01J0019-00R; B01J0020-20; B01J0020-32;
                       B01J0021-18; B01J0023-889H; B01J0035-04;
                       B01J0037-02C8; B01J0037-02M4; C01B0031-02B;
                       C04B0041-52; C04B0041-89; C10G0002-00B2D;
                       C10G0002-00B2D2A; C23C0008-02; C23C0008-80;
                       C23C0026-00; C23C0028-00; F28F0021-02
ICO:                   L01D0323:28B; L01J0035:10; L01J0037:02G;
                       L01J0037:03B2; Y01N0006:00
USCLASS NCLM:          210/184.000
        NCLS:          210/502.100
```

BASIC ABSTRACT:

US 20050040090 A1 UPAB: 20050708

NOVELTY - A porous, carbon nanotube-containing structure is made by, providing a support material having through-porosity; depositing seed particles on the support material to form a seeded support material; and heating the support material and simultaneously exposing the seeded support to a carbon nanotube precursor gas to grow carbon nanotubes on the surface of the seeded support material.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:

(1) a porous carbon nanotube containing structure, comprising a large pore support having through porosity; carbon nanotubes disposed over the large pore support; and a mesoporous silica film disposed between the large pore support and the carbon nanotubes;

(2) a heat exchanger, comprising a porous carbon nanotube containing structure, comprising a large pore support having through porosity; and carbon nanotubes disposed over the large support;

(3) a method of making a carbon nanotube containing structure, comprising providing a support; applying a surfactant template composition over the support; forming a solid, silica-containing layer from the surfactant template composition that adheres to the support; and growing carbon nanotubes on the silica-containing layer;

(4) a microchannel heat exchanger, comprising microchannel(s); and carbon nanotubes disposed within the microchannel(s);

(5) a filter comprising a porous carbon nanotube containing structure, comprising a large pore support having through porosity; and carbon nanotubes disposed over the large pore support.

USE - For making a porous, carbon nanotube-containing structure useful in processes and devices including catalysis , adsorption, ion exchange, separation of chemical components, filtration, storage of gases, i.e. hydrogen or carbon dioxide, distillation including reactive distillation, a support structure for chemical including biological sensors, a support structure to immobilized proteins for bioprocessing, and a component in a heat exchanger.

ADVANTAGE - The inventive method creates porous, carbon nanotube-containing structure with larger pores through which flow occurs, providing improved heat transport, control of the direction of heat transport, enhanced surface area, excellent thermal stability, excellent thermal conductivity, reduced mass transfer limitations, utility in microreactors, ready adaptability in fixed- bed type reactors, and increased loading levels of catalyst or other active materials.

DESCRIPTION OF DRAWINGS - The figure shows a scanning electron micrograph of metal foam having a coating of carbon nanotubes. TECHNOLOGY FOCUS:

INORGANIC CHEMISTRY - Preferred Component: The metal oxide layer comprises alumina.

Preferred Method: The method further comprises forming a surfactant templated solution; depositing the surfactant template solution over the support material; and depositing a metal oxide layer on the support prior to applying the surfactant template composition. The alumina layer is applied by chemical vapor deposition. The surfactant template composition is dip coated onto the support.

Preferred Material: The support is a metal support comprising metal foam, a honeycomb, or metal mesh.

MECHANICAL ENGINEERING - Preferred Component: The heat exchanger further comprises microchannel(s) where the porous carbon nanotube containing structure above is disposed within the microchannel(s). The microchannel heat exchanger further comprises a mesoporous silica film disposed between a microchannel surface and the carbon nanotubes.

CERAMICS AND GLASS - Preferred Material: The support may also be a ceramic support. The porous carbon nanotube-containing structure further comprises mesoporous silica disposed within the large pores of the support to substantially fill the large pores.

EXTENSION ABSTRACT:

EXAMPLE - An engineered catalyst was fabricated using an iron chromium aluminum yttrium intermetallic foam (80 ppi, 85% porosity) oxidized at 900 degrees C in air for 2 hours and coated with submicron layer of aluminum oxide using metal oxide chemical vapor deposition (MOCVD) carried out using aluminum isopropoxide as the precursor with nitrogen carrier gas in an oxidizing environment containing 14 volume% of oxygen under 5 Torr at 850 degrees C. The coated foam was cooled to room temperature after the MOCVD. A surfactant template solution was prepared according to weight ratio of polyoxyethylene 10 cetyl ether:ethyl alcohol:tetraethylorthosilicate:hydrochloric acid:ferrous nitrate nonahydrate:water of 17.5:75:40:1:40:100. The substrate was calcined at a ratio of 1 degrees C/minute from room temperature to 450 degrees C, and held isothermally at that temperature for 1 hour under air before cooling to room temperature. It was loaded into a quartz reactor, heated under 500 standard cubic centimeter (sccm) of nitrogen flow from room temperature to 700 degrees C. Ethylene (500 sccm) was introduced into the flow reactor for three-20 minute periods, with 5 minutes oxygen/nitrogen purge between periods. After the combined growth time

of 60 minutes, the substrate was cooled from 700 to 450 degrees C under nitrogen. At 450 degrees C, air was introduced for 5 minutes to oxidize the surface of the carbon nanotube. The substrate was dip coated with a colloid alumina solution with aluminum oxide (approximately 5 weight%); and with an aqueous solution containing cobalt and rhenium precursors.

FILE SEGMENT: CPI
MANUAL CODE: CPI: B05-A01B; B05-B02C; B05-U03; B11-C09; D05-H09

L53 ANSWER 2 OF 2 WPIX
ACCESSION NUMBER: 1994-010276 [02] WPIX
DOC. NO. CPI: C1994-004174 [02]
TITLE: Commercial scale gas phase aldol condensation reaction - in an indirect heat transfer type, non-isothermal reactor with a fixed bed solid catalyst
DERWENT CLASS: E15; E17; J04
INVENTOR: OKADA K; TAKAMOTO T; UEDA H
PATENT ASSIGNEE: (SUMO-C) SUMITOMO CHEM CO LTD
COUNTRY COUNT: 11

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
EP 578444 <--	A1	19940112	(199402)*	EN	7[2]	
JP 06025065 <--	A	19940201	(199409)	JA		
CA 2099626 <--	A	19940110	(199413)	EN		
US 5334770 <--	A	19940802	(199430)	EN	5[2]	

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
EP 578444 A1		EP 1993-305191	19930701
JP 06025065 A		JP 1992-182220	19920709
US 5334770 A		US 1993-79830	19930623
CA 2099626 A		CA 1993-2099626	19930624

PRIORITY APPLN. INFO: JP 1992-182220 19920709
INT. PATENT CLASSIF.:
IPC RECLASSIF.: B01J0023-04 [I,A]; B01J0023-04 [I,C]; B01J0008-02 [I,A]; B01J0008-02 [I,C]; B01J0008-06 [I,A]; C07B0061-00 [I,A] ; C07B0061-00 [I,C]; C07C0045-00 [I,C]; C07C0045-74 [I,A]; C07C0047-20 [I,C]; C07C0047-21 [I,A]; C07C0047-28 [I,C]; C07C0047-32 [I,A]
ECLA: B01J0008-02H; B01J0008-06H; C07C0045-74; C07C0045-74+49/203; C07C0045-74+49/603
ICO: L01J0208:00C2D4F
JAP. PATENT CLASSIF.:
MAIN/SEC.: B01J0023-04 X; C07B0061-00 300; C07C0045-74; C07C0047-21; C07C0047-32
FTERM CLASSIF.: 4G069; 4H006; 4H039; 4H006/AA02; 4H006/AC13; 4H006/AC21; 4H006/AC25; 4H006/AC28; 4H006/AC41;

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                       4H006/BA02; 4H006/BA06; 4H006/BA07; 4H006/BA09;
                       4H006/BA28; 4H006/BA29; 4H006/BA30; 4H006/BA32;
                       4H006/BA55; 4H006/BA82; 4H006/BC13; 4H006/BD21;
                       4H006/BD81; 4H039/CA12; 4H039/CA19; 4H039/CA29;
                       4H039/CA39; 4H039/CA40; 4H039/CA60; 4H039/CA61;
                       4H039/CA62; 4H039/CF30; 4H039/CG10; 4H039/CH10;
                       4H039/CL25
BASIC ABSTRACT:
           EP 578444 A1   UPAB: 20050506
           Aldol condensation of active hydrogen-containing cpd. comprises feeding
      it in gaseous form to an indirect heat transfer-type, non- isothermal reactor
      provided with a fixed bed catalyst.
           The reactor is pref. a jacket-type shell and tube heat exchanger type
      (both pref) or an external heat exchanger type reactor. The gaseous active
      hydrogen-containing cpd. (pref. acetone) is pref. flowed downwards in the
      reactor.
           USE/ADVANTAGE - The process is partic. used to produce isophorone and/or
      mesityl oxide. The process performs efficiently on a commercial scale. The
      reactor is of simple design. Sufficient heat exchange can be effected even
      with a large heat of reaction.
FILE SEGMENT:          CPI
MANUAL CODE:           CPI: E10-F02A1; E10-F02B; J04-E01


=> FIL CEABA-VTB COMPENDEX ENERGY PASCAL JAPIO TEMA DISSABS TULSA
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=> D L163 1-36 ALL
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L163 ANSWER 1 OF 36 CEABA-VTB COPYRIGHT 2010 DECHEMA on STN
AN 2001(09):0612 CEABA-VTB FS V Full-text
DN PVTB: 0019/178
TI Catalytic reduction of NO(sub x) emission at a nitric acid plant
Katalytische NO(sub x)-Reduktion im Abgas von Salpetersaeureanlagen
AU Egyhsszy, T.; Kovsscs, J.; Fueloep, T.; Blazsek, I.
CS University of Veszprem, Veszprem, Ungarn
SO Hungarian Journal of Industrial Chemistry (2000) 28(1), 7 Reference(s), 67-73, 6f, 7t
CODEN: HJICAI ISSN: 0133-0276
LA English
AB This paper described a pilot scale reverse flow adiabatic packed bed reactor for the catalytic reduction of NO(sub x) by natural gas during the production of nitric acid. By alternating the flow direction of the reaction mixture, the catalytic bed of the adiabatic reactor acted both as a catalyst and a regenerative heat exchanger simultaneously. The reverse flow allowed the weakly exothermic reactions to operate autothermically near the optimum temperature. Processes with higher exothermic reactions necessitated placing a heat exchanger in the bed to control the catalytic bed temperature. This reactor was applicable to both selective and non-selective catalytic reduction of NO(sub x) content of tail gases from nitric acid plants, and reduced energy and investment costs compared with conventional processes.(Woolsgrove, Charlotte)
ABDE Die Verf. vergleichen im Wesentlichen den Energieaufwand fuer zwei verschiedene Entstickungsverfahren fuer Abgas aus Salpetersaeureanlagen.1. Die nichtselektive katalytische NO(sub x)-Reduktion, mit Erdgas als Reduktionsmittel. Als Folge des hohen Energieumsatzes soll ein Gasturbinen-Kompressorsatz fuer die Prozessluftkompression sorgen, der vom Abgas angetrieben wird.2. Die selektive katalytische NO(sub x)-Reduktion: Infolge niedrigen Energiegehaltes des Abgases muss die Prozessgaskompression mittels Elektromotor erfolgen.Welcher Prozess guenstiger ist, haengt vom Preis fuer Erdgas und elektrischer Energie ab. Einmal mehr wird der 'reverseflow reactor' empfohlen und im Technikumsmassstab untersucht.Anm. d. Reference: Der letztgenannte Reaktortyp taucht in der Literatur fuer katalytische Abgasreinigung immer wieder auf, wird in der Praxis aber kaum genutzt. Ursachen hierfuer sind: 1. relativ komplizierte Sicherheitsschaltungen; 2. die haeufig unterschaetzten Katalysatorkosten, da das Prinzip beinhaltet, dass zu jedem Zeitpunkt immer nur ein relativ kleiner Anteil des eingesetzten Katalysators aktiv ist.(Kesper, Bernt (Degussa-Huels, Rheinfelden))
CC 3PLD Chemical process-development, -modelling, -performance and -optimization
3UXG Air pollution
3PLD Chemical process-development, -modelling, -performance and -optimization
3PLA Chemical equilibrium, kinetics, catalysis, chemical solutions
CT catalytic reduction; emission control; nitric acid; Nitrogen oxide; Process plant

L163 ANSWER 2 OF 36 CEABA-VTB COPYRIGHT 2010 DECHEMA on STN
AN 2000(04):0067 CEABA-VTB FS V Full-text
DN PVTB: w2000/9f
TI A new reactor concept for endothermic high-temperature reactions
Ein neues Reaktorkonzept fuer endotherme Hochtemperaturreaktionen
AU Frauhammer, J.; Eigenberger, G.; v. Hippel, L.; Arntz, D.
CS Univ. Stuttgart, Germany; DEGUSSA Hanau, Germany; DEGUSSA Corp., Theodore, USA
SO Chemical Engineering Science; Oxford, Frankfurt (1999) 54(15&16), 3661-3670

CODEN: CESCAC ISSN: 0009-2509
DT Journal
LA English
AB This new reactor concept for autothermal operation involves placing endothermic and combustion reactions in adjacent channels of a countercurrent fixed-bed reactor, where heat exchange ensures that the feed and exit of both reactions are at low temperatures, while the high-temperature middle section allows for high conversion and rapid quench. The concept has been validated in tests with methane steam reforming, using a ceramic honeycomb monolith heat exchanger with catalyst deposited on its walls, though operation has been limited to 800 degC because of limited thermal stress resistance of the monolith.
ABDE In dem von den Verf. vorgestellten Reaktorkonzept zur autothermen Reaktionsfuehrung steht eine endotherme Synthesereaktion mit einer exothermen waermeliefernden Reaktion in einem monolithischen Rektor im Waermeaustausch. Die beiden Gasstroeme werden im Gegenstrom gefuehrt. Durch den Waermetausch im Gegenstrom sind bei geschickter Wahl der Parameter beide austretenden Gasstroeme kalt. Die bei der exothermen Reaktion freiwerdende Waerme wird dann ausschliesslich zur Beheizung der endothermen Reaktion eingesetzt.Im ersten Teil entwickeln die Verf. zunaechst das Verstaendnis fuer das prinzipielle Verhalten des Gegenstromreaktors. Dazu wird ein Modell fuer den Reaktor aufgestellt und in einem ersten Schritt statt der endothermen Reaktion nur ein inerter Gasstrom betrachtet, der mit einer in den benachbarten Kanaelen ablaufenden exotherme Reaktion im Waermeaustausch steht. An diesem Beispiel wird gezeigt, in welchen Paramterbereichen die exotherme Reaktion stationaer betrieben werden kann ohne zu verloeschen und welche Auswirkungen eine Veraenderung der Massenstroeme auf das Temperaturprofil und die Maximaltemperatur im Reaktor hat. Als zentraler Paramter wird das Verhaeltnis der Waermeinhalte der Reaktionsstroeme identifiziert.Im zweiten Teil des Artikels wird (immer noch in der Simulation) als endotherme Beispielreaktion das Dampfreformieren von Methan gewaehlt. An diesem Beispiel wird die Auswirkung der jetzt hinzukommenden endothermen Reaktion auf das Reaktorverhalten betrachtet. Verschiedene Moeglichkeiten zur Optimierung des Reaktors durch axiale Strukturierung des Katalysators in den Kanaelen werden diskutiert.Abschliessend stellen die Verf. erste experimentelle Ergebnisse und eine patentierte Loesung zur Verteilung der Gasstroeme auf die benachbarten Kanaele vor. Hauptproblem ist die Stabilitaet der verwendeten Monolithe bei den hohen auftretenden Temperaturen (bis 800thinsp.C).
CC 3PLL Chemical apparatuses and plants
3PLC Chemical reactions, chemical reaction engineering
3EIC Heat transfer engineering, heat exchangers
3PLA Chemical equilibrium, kinetics, catalysis, chemical solutions
CT mathematical model; endothermic reaction; high-temperature reaction; countercurrent flow; heat exchanger

L163 ANSWER 3 OF 36 CEABA-VTB COPYRIGHT 2010 DECHEMA on STN
AN 1999(00):1574 CEABA-VTB FS V Full-text
DN VTB: 1999(20):72
TI Optimization of direct and indirect cooled multiple-bed reactors experiencing catalyst decay
Optimierung direkt und indirekt gekuehlter Mehrfachbett-Reaktoren nach den Erfahrungen der Katalysator-Desaktivierung
AU Bozga, G. (Polytechnica Univ., 77206 Bucharest, Romania)
CS Univ. of Bukarest (R)
SO Chem. Eng. Technol. (1999) 22(1), 57/63, 11 Abb, 1 Tab, 16 Qu
CODEN: CETEER ISSN: 0930-7516
DT Journal

LA English
AB A study was made of the optimal control of a multi-bed catalytic reactor used for an exothermic reversible reaction. Various control strategies were used and the effect of these on the total production was determined. An analysis of two cooling techniques, the indirect method using interstage heat exchangers, and the direct method involving injection of a cold reactant. It was shown that the indirect method of cooling was more effective.
ABDE Die adiabatisch arbeitenden katalytischen Mehrfachbett-Reaktoren zeichnen sich durch konstruktive Einfachheit aus. Als Folge der Katalysator-Desaktivierung faellt die katalytische Leistung des Reaktors mit der Zeit kontinuierlich ab. Die besten Loesungen fuer diese Desaktivierungsprobleme werden durch Darstellung mit genaueren mechanistischen mathematischen Modellen erhalten, die allgemein die Anwendung nichtlinearer Optimierungs-Algorithmen verlangen. Die Optimierung eines katalytischen Merhfachbett-Reaktors, in dem eine exotherme reversible Reaktion ablaeuft, wird neu betrachtet. Einige Regelungsprobleme, die sich in der Leistungsindex-Signifikanz und der Regelungsanordnung unterscheiden, sind geloest worden. Der Leistungsindex ist entweder die gesamte Reaktor-Produktivitaet oder ein angenaeherter Ausdruck fuer seinen Betriebsnutzen ueber eine bestimmte Zeit. Sowohl die praktizierten Zwischenstufen-Kuehltechniken, die indirekte Kuehlung (unter Verwendung von Zwischenstufen-Waermeaustauschern) als auch die direkte Kuehlung (unter Einlauf von Kuehlmedium (Kaltschuss) werden gruendlich untersucht. Die Kaltschuss-Kuehlung ist wegen der geringen Flexibilitaet bei der Veraenderung der Einsatzprodukt-Temperaturen auf die Betten und der kuerzeren Reaktionszeit ein Leistungstraeger mit gemindertem Einfluss. Die gekoppelten Einfluesse von Reaktionsreversibilitaet und Katalysator-Desaktivierung auf die Reaktor-Prozessleistung werden analysiert; z.B. wird in Betracht gezogen, ob das Gesamteinsatzprodukt fest oder variabel, verteilt oder nicht verteilt oder die Einlasstemperatur im ersten Bett variabel oder konstant sein kann. Text: engl. 11 Abb, 1 Tab, 16 Qu
Reference: O. Benn (ehem. Bayer)
CC 3PLA Chemical equilibrium, kinetics, catalysis, chemical solutions
3BN Thermodynamics, statistical physics, heat flow
3PLC Chemical reactions, chemical reaction engineering
3PLD Chemical process-development, -modelling, -performance and -optimization
CT CATALYST; COOLING; POWER OR PERFORMANCE; REACTOR; ADIABATIC REACTOR; CATALYST DEACTIVATION; CONTROL STRATEGY; FIXED-BED REACTOR; HEAT TRANSFER; MULTISTAGE REACTOR; OPTIMIZATION
ST REAKTOR; KATALYSATOR

L163 ANSWER 4 OF 36 CEABA-VTB COPYRIGHT 2010 DECHEMA on STN
AN 1993(06):7765 CEABA-VTB FS V Full-text
DN CEABA: 1993:3027890
TI Catalysis and reactor requirements for the oxidative coupling of methane
AU Dautzenberg, F. M.; Schlatter, J. C.; Fox, J. M.; Rostrup-Nielsen, J. R. (Catalytica Inc., Mountain View, CA 94043, USA)
SO Catal. Today (1992) 13(4), p.503-509
CODEN: CATTEA ISSN: 0920-5861
DT Journal
LA English
AB The feasibility and cost effectiveness of using a multitubular reactor and a fluidized-bed reactor for oxidative coupling of methane to produce liquid fuels were examined. A multitubular reactor would have to have an impracticably large heat exchange system to control the exothermic reaction, and consequently the fluidized-bed reactor with its more uniform temperature distribution would be suitable.
CC 3PLA Chemical equilibrium, kinetics, catalysis, chemical solutions

CT EXOTHERMIC REACTION; FLUIDIZED-BED
REACTOR; HYDROCARBON PRODUCTION; KINETICS CATALYSIS
; METHANE; OXIDATIVE COUPLING; REACTOR DESIGN; TUBULAR
REACTOR

L163 ANSWER 5 OF 36 CEABA-VTB COPYRIGHT 2010 DECHEMA on STN
AN 1978(00):0075 CEABA-VTB FS V Full-text
DN VTB: 1978(20):15
TI Auswahlkriterien fuer nichtkatalytische
Gas/Feststoff-Hochtemperaturreaktoren
AU REH, L.
SO Chem.-Ing.-Tech. (1977) 49(10), 786/795, 17f,1t,561
CODEN: CITEAH ISSN: 0009-286X
DT Journal
LA German
AB A preliminary survey of the types of reactors avail able for carrying out gassolids reactions is followed by a discussion of various selection criteria for choosing the most suitable type of reactor, with special attention being paid to high-temperature reactions. Individual topics discussed are : flow behaviour and relative rates of flow of gassolids in beds, tempera ture control of endothermic and exothermic reactions, the gassolids reaction surface area, heat and mass exchange, and the reaction behaviour of solids. On the basis of these criteria, based on examples taken from practice, the importance of the choice of grain size in reactors with high space-time yields is outlined.
ABDE Parameter fuer Gas/Feststoffreaktoren. Unterscheidung der Reaktoren aufgrund des Bewegungszustandes des Feststoffs: Schuettgutreaktor, Wirbelschichtreaktor, Foerderreaktor. Einsatz von Schuettgutreaktoren. Stroemungszustand, Relativgeschwindigkeit und Mischungsverhalten durchstroemter Schichten. Zustandsdiagramm fuer gegen die Schwerkraft durchstroemte Gas-Feststoff-Systeme. Einsatz von Wirbelschicht- und Foerderreaktoren vorzugsweise bei Feststoffen kleiner Teilchengroesse. Reaktionsflaeche, Waermeund Stoffaustausch. Abhaengigkeit der bezogenen spezifischen Feststoffoberflaeche vom Teilchendurchmesser und ihr Einfluss auf die Transportgesetze. Nach verschiedenen Calciniersystemen hergestelltes Al2O3. Reaktionsmodelle: kontinuierliche Reaktion, Modell des unreagierten Kerns und des schrumpfenden Teilchens. Zersetzungszeit in Abhaengigkeit von der Korngroesse. Temperatursteuerung, z.B. bei der Tonerde-Calcinierung. Flammen-Zyklon-Reaktor fuer Hochtemperaturreaktionen schmelzender Feststoffe (Pulvermetallurgie). (Ebert)
CC 3PLC Chemical reactions, chemical reaction engineering
3PLC Chemical reactions, chemical reaction engineering
3EI Thermal engineering, refrigeration and cold storage
3BB Mechanics of solids, liquids and gases
3IR Control and control systems
CT HIGH TEMPERATURE; REACTION TECHNOLOGY; REACTOR;
ALUMINIUM; CATALYTIC CRACKING; COATING; CONVEYING;
DEGRADATION; FLOW; FLUIDIZED BED; FLUIDIZED-BED
REACTOR; HEAT; MASS TRANSFER; METAL OXIDE; NUCLEAR
REACTOR; PARTICLE SIZE DISTRIBUTION; PHASE
EQUILIBRIUM; PLANT CONTROL; PYROLYSIS; REACTION; SURFACE;
TEMPERATURE; FURNACE; HEAT TRANSFER
ST REAKTOR, HOCHTEMP. -, GAS-FESTSTOFF-, AUSWAHLKRITERIEN, 56 QU;
GAS/FESTSTOFF; DURCHSATZ; ROESTVERFAHREN; FLAMMENREAKTOR

L163 ANSWER 6 OF 36 CEABA-VTB COPYRIGHT 2010 DECHEMA on STN
AN 1970(10):9448 CEABA-VTB FS V Full-text
DN CEABA: 1970:8605378
TI A sulphuric acid process that could cut capital and operating costs
CS Academy Sciences, Novosibirsk, USSR

SO Chem. Eng. (Int. Ed.) (1985) 92(24), p.15
CODEN: CEIED5
DT Journal
LA English
AB The process works by a novel unsteady method of sulphur dioxide oxidation, and it can be used for production of acid from flue gases from nonferrous metallurgical operations, or gases derived from sulphur, pyrites, phosphogypsum, hydrogen sulphide and other raw materials if the gases contain from 0.5-12% sulphur dioxide. Key to the process is an exothermic reaction that takes place in a heat front, which creeps along the catalyst bed.The heat front is kept in the bed by periodic reversal of the reaction mixture flow. The catalyst bed also acts as a regenerative heat exchanger, permitting the usual exchangers for the contact process to be eliminated, or at least drastically reduced in surface area. Metal weight can be reduced by 40%, and capital cost of the contact compartment cut by 35-45% in some cases; the life of the vanadium catalyst is the same as for conventional units.
CC 3AB Project engineering and planning of plants, equipment construction
CT SULFURIC ACID

L163 ANSWER 7 OF 36 COMPENDEX COPYRIGHT 2010 EEI on STN
AN 2005-098863332 COMPENDEX Full-text
TI Design of a microstructured reactor with integrated heat-exchanger for optimum performance of a highly exothermic reaction
AU Rebrov E.V.; De Croon M.H.J.M.; Schouten J.C.
CS Rebrov E.V.; De Croon M.H.J.M.; Schouten J.C. (Lab. of Chemical Reactor Engineering, Schuit Institute of Catalysis, Eindhoven University of Technology, PO Box 513, 5600 MB Eindhoven (NL))
EMAIL: j.c.schouten@tue.nl
SO Catalysis TodayStructured Catalysts and Reactors (15 Sep 2001) Volume 69, Number 1-4, pp. 183-192, 18 refs.
Editor(s): Moulijn J.A.; Stankiewicz A.
CODEN: CATTEA ISSN: 0920-5861
DOI: 10.1016/S0920-5861(01)00368-6
Published by: Elsevier
Conference: Structured Catalysts and Reactors Delft (NL), 21 Oct 2001
PUI S0920586101003686
CY Netherlands
DT Journal; Article; Experimental
LA English
SL English
ED Entered STN: 4 Jan 2009
Last updated on STN: 4 Jan 2009
AB The activity and the heat transfer characteristics of several microstructured reactors have been compared in the ammonia oxidation on Pt catalyst. The main parameters which influence reactor performance are catalyst loading, temperature, and the intrinsic conductivity of the reactor material. In case of aluminum as a reactor material, hot spot temperatures were within 5°C at full conversion of 6vol.% NH3. Temperature gradients were considerably larger when the microreactor was made from pure platinum due to the smaller intrinsic material conductivity. As a result, the maximum N 2O selectivity was by 20% lower than in the case of the aluminum-based reactor due to considerable differences in the selectivities between the central and wall channels. Experimental data obtained on the above microreactors were used to design an externally cooled cross flow microreactor/heat- exchanger operating at almost isothermal conditions even with a reaction mixture corresponding to an adiabatic temperature rise of about 1400°C. Such system can provide new opportunities for improvement of existing gas/solid

catalytic processes with strongly exothermic reactions. .COPYRGT. 2001

CC 804 Chemical Products Generally; 803 Chemical Agents and Basic Industrial Chemicals; 802.2 Chemical Reactions; 804.2 Inorganic Compounds; 802.1 Chemical Plants and Equipment; 641.2 Heat Transfer; 616.1 Heat Exchange Equipment and Components; 801.4 Physical Chemistry

CT *Heat exchangers; Catalysis; Catalysts ; Chemical reactors; Heat transfer; Microstructure; Nitrogen oxides; Oxidation; Packed beds

ST Material conductivity; Microreactors; Monolith structures; Partial oxidation

ET Pt; C; H*N; NH; N cp; cp; H cp; N; O

L163 ANSWER 8 OF 36 COMPENDEX COPYRIGHT 2010 EEI on STN

AN 2002-136898937 COMPENDEX Full-text

TI A novel reverse flow reactor coupling endothermic and exothermic reactions. Part II: Sequential reactor configuration for reversible endothermic reactions

AU Van Sint Annaland M.; Scholts H.A.R.; Kuipers J.A.M.; Van Swaaij W.P.M.

CS Van Sint Annaland M.; Scholts H.A.R.; Kuipers J.A.M.; Van Swaaij W.P.M. (Department of Chemical Engineering, Twente University of Technology, P.O. Box 217, 7500 AE Enschede (NL))
EMAIL: m.vansintannaland@ct.utwente.nl

SO Chemical Engineering Science (7 Mar 2002) Volume 57, Number 5, pp. 855-872, 10 refs.
CODEN: CESCAC ISSN: 0009-2509
DOI: 10.1016/S0009-2509(01)00423-7
Published by: Elsevier Ltd

PUI S0009250901004237

CY United Kingdom

DT Journal; Article; Theoretical

LA English

SL English

ED Entered STN: 4 Jan 2009
Last updated on STN: 4 Jan 2009

AB The new reactor concept for highly endothermic reactions at elevated temperatures with possible rapid catalyst deactivation based on the indirect coupling of endothermic and exothermic reactions in reverse flow, developed for irreversible reactions in Part I, has been extended to reversible endothermic reactions for the sequential reactor configuration. In the sequential reactor configuration, the endothermic and exothermic reactants are fed discontinuously and sequentially to the same catalyst bed, which acts as an energy repository delivering energy during the endothermic reaction phase and storing energy during the consecutive exothermic reaction phase. The periodic flow reversals to incorporate recuperative heat exchange result in low temperatures at both reactor ends, while high temperatures prevail in the centre of the reactor. For reversible endothermic reactions, these low exit temperatures can shift the equilibrium back towards the reactants side, causing 'back-conversion' at the reactor outlet. The extent of back-conversion is investigated for the propane dehydrogenation/methane combustion reaction system, considering a worst case scenario for the kinetics by assuming that the propylene hydrogenation reaction rate at low temperatures is only limited by mass transfer. It is shown for this reaction system that full equilibrium conversion of the endothermic reactants cannot be combined with recuperative heat exchange, if the reactor is filled entirely with active catalyst. Inactive sections installed at the reactor ends can reduce this back-conversion, but cannot completely prevent it.

Furthermore, undesired high temperature peaks can be formed at the transition point between the inactive and active sections, exceeding the maximum allowable temperature (at least for the relatively fast combustion reactions). A new solution is introduced to achieve both full equilibrium conversion and recuperative heat exchange while simultaneously avoiding too high temperatures, even for the worst case scenario of very fast propylene hydrogenation and fuel combustion reaction rates. The proposed solution utilises the movement of the temperature fronts in the sequential reactor configuration and employs less active sections installed at either end of the active catalyst bed and completely inactive sections at the reactor ends, whereas propane combustion is used for energy supply. Finally, it is shown that the plateau temperature can be effectively controlled by simultaneous combustion of propane and methane during the exothermic reaction phase.

CC 805.1 Chemical Engineering; 804.1 Organic Compounds; 804 Chemical Products Generally; 803 Chemical Agents and Basic Industrial Chemicals; 802.2 Chemical Reactions; 802.1 Chemical Plants and Equipment; 801.4 Physical Chemistry; 522 Gas Fuels; 521.1 Fuel Combustion

CT *Chemical engineering; Catalyst deactivation; Catalysts; Chemical reactors; Combustion; Dehydrogenation; Propane; Reaction kinetics

ST Reverse flow reactors

ET I

L163 ANSWER 9 OF 36 COMPENDEX COPYRIGHT 2010 EEI on STN

AN 1999-154568961 COMPENDEX Full-text

TI Optimization of direct and indirect cooled multiple-bed reactors experiencing catalyst decay

AU Bozga Grigore

CS Bozga Grigore (Politehnica Univ, Bucharest (RO))

SO Chemical Engineering and Technology (1999) Volume 22, Number 1, pp. 57-63, 16 refs.
CODEN: CETEER ISSN: 0930-7516
Published by: Wiley-VCH Verlag Berlin GmbH

DT Journal; Article; General Review; Theoretical

LA English

ED Entered STN: 3 Jan 2009
Last updated on STN: 3 Jan 2009

AB The optimal control of a multi-bed catalytic reactor hosting an exothermic, reversible reaction is reconsidered. Several control problems, which differ by performance index significance and control configuration, have been solved. The performance index is either the total reactor production or an approximate expression of its operation benefit over a fixed time. Both practiced interstage cooling techniques, the indirect cooling (using interstage heat exchangers) and the direct cooling by injection of cold reactant (cold-shot), are analyzed. It is underlined that the cold-shot cooling is less performant due to the lower flexibility in the variation of feed temperatures on the beds and smaller value of the reaction time.

CC 641.2 Heat Transfer; 731 Automatic Control Principles and Applications; 731.1 Control Systems; 802.1 Chemical Plants and Equipment; 802.2 Chemical Reactions; 802.3 Chemical Operations

CT *Chemical reactors; Catalysis; Cooling; Optimal control systems; Process control

ST Catalyst decay; Cooled multiple-bed reactors

L163 ANSWER 10 OF 36 COMPENDEX COPYRIGHT 2010 EEI on STN

AN 1999-424774456 COMPENDEX Full-text

TI Styrene synthesis in a reverse-flow reactor

AU Kolios Grigorios; Eigenberger Gerhart
CS Kolios Grigorios; Eigenberger Gerhart (Institut fur Chem. Verfahrenstechnik, Universitat Stuttgart, Boblinger Strasse 72, 70199 Stuttgart (DE))
EMAIL: kolios@icvt.uni-stuttgart.de
SO Chemical Engineering ScienceISCRE 15 part A (Jul 1999)
Volume 54, Number 13-14, pp. 2637-2646, 19 refs.
CODEN: CESCAC ISSN: 0009-2509
DOI: 10.1016/S0009-2509(98)00444-8
Published by: Elsevier Ltd
Conference: Proceedings of the 1998 15th International Symposium on Chemical Reaction Engineering, ISCRE 15 Newport Beach, CA, USA, 13 Sep 1998-16 Sep 1998
Organizer(s): NSF
PUI S0009250998004448
CY United Kingdom
DT Journal; Article; Experimental
LA English
SL English
ED Entered STN: 3 Jan 2009
Last updated on STN: 3 Jan 2009
AB Multifunctional reactor concepts for thermal coupling of endothermic synthesis reactions with an exothermic auxiliary reaction are presented. The processes are carried out in an autothermal operation mode incorporating regenerative heat exchange within the reactor through periodic flow reversal. Catalytic dehydrogenation of ethylbenzene to styrene is considered as a particular example, where catalytic combustion of the produced hydrogen serves as a heat source. Two alternative operation modes are discussed, the asymmetric operation mode, where the synthesis reaction and the combustion are separated in time and the symmetric operation mode with external combustion and hot gas injection, or with air injection and in situ hydrogen combustion. A lab-scale reactor with an integrated catalytic burner has been set-up and experiments with the symmetric operation mode have been performed. The symmetric operation mode with hot gas injection proves to be an attractive alternative to conventional processes for styrene synthesis: it allows for high conversions and high selectivities, combined with an efficient heat recovery.
CC 521.1 Fuel Combustion; 616.1 Heat Exchange Equipment and Components; 801.4 Physical Chemistry; 802.1 Chemical Plants and Equipment; 802.2 Chemical Reactions; 804 Chemical Products Generally
CT *Styrene; Catalyst activity; Chemical reactors; Combustion; Heat exchangers; Hydrogen; Synthesis (chemical); Thermal effects; Waste heat utilization
ST Autothermal; Catalytic dehydrogenation; Endothermic synthesis; Fixed bed; Periodic flow reversal; Reverse flow reactor; Styrene synthesis; Thermal coupling

L163 ANSWER 11 OF 36 COMPENDEX COPYRIGHT 2010 EEI on STN
AN 1993-030632507 COMPENDEX Full-text
TI Relevance of overall heat transfer coefficients in the simulation of catalytic fixed bed reactors with the heterogeneous one-dimensional model
AU Berto C.A.; Barreto G.F.
CS Berto C.A.; Barreto G.F. (UNLP, La Plata (AR))
SO Applied Mathematical Modelling (1992) Volume 16, Number 10, pp. 520-533, 22 refs.
CODEN: AMMODL ISSN: 0307-904X
DT Journal; Article; Theoretical
LA English

ED Entered STN: 3 Jan 2009
Last updated on STN: 3 Jan 2009

AB Several expressions, including one introduced in this work, for overall heat transfer coefficients are used to evaluate the performance of the heterogeneous one-dimensional (Het 1-D) model for catalytic fixed bed reactors with simultaneous heat exchange. From testing a large amount of reacting and operating conditions, it is shown that very precise estimations, compared to the results of the heterogeneous two-dimensional model, can usually be achieved up to critical conditions for parametric sensitivity with those expressions accounting for the effect of temperature on the chemical reaction rate. Some conditions with relatively large ratios of tube to particle diameters may lessen the accuracy of the Het 1-D model, and quantitative bounds are identified for them. The relevance of the Het 1-D model compared to the pseudo-homogeneous 1-D model is also emphasized.

CC 641.2 Heat Transfer; 802.2 Chemical Reactions; 921 Applied Mathematics; 944 Moisture, Pressure and Temperature, Radiation Measuring Instruments; 944.6 Temperature Measurements

CT *Heat transfer; Chemical reactions; Temperature distribution

ST Catalytic fixed bed reactors; Conservation equations; Endothermic reactions; Exothermic reactions; Heterogeneous one-dimensional model (Het 1-D); Heterogeneous two-dimensional model; Pseudo-homogeneous one-dimensional model

L163 ANSWER 12 OF 36 ENERGY COPYRIGHT 2010 USDOE/IEA-ETDE on STN

AN 1999(8):33710 ENERGY Full-text

TI Wrong-way behavior of fixed-bed reactor in a Fischer-Tropsch synthesis.

AU Liu Quansheng; Zhang Zhixin; Zhou Jinglai (Chinese Academy of Sciences, Taiyuan, Shanxi (China). Inst. of Coal Chemistry)

NR CONF-970931--

SO Fourteenth annual international Pittsburgh coal conference and workshop: Proceedings.
Anon.
Pittsburgh, PA: Pittsburgh Coal Conference. 1997. p. 7, Paper S24.5 of [1500 p.]. Pittsburgh Coal Conference, 1140 Benedum Hall, University of Pittsburgh, Pittsburgh, PA 15261 (United States) $50.00 for the CD.
Conference: 14. annual international Pittsburgh coal conference and workshop: clean coal technology and coal utilization, Taiyuan (China), 23-27 Sep 1997

DT Book Article; Conference

CY United States

LA English

FA AB

AB Fischer-Tropsch Synthesis is one important way to produce liquid fuel from coal-based or natural gas-based syngas. This reaction system is a highly exothermic reaction system, so usually it is finished in a multitubular catalytic fixed-bed reactor of the heat-exchanger type. The control of the reactor maximal temperature and the temperature profile is the key to this type reactor. Generally one can use a steady state model to analyze the temperature profile of a fixed-bed reactor. In the view of dynamics, one should use a dynamic model to analyze the dynamic features of the reactors. The wrong-way behavior is one of these features and is caused by the difference in the speeds of propagation of the concentration and temperature disturbances in the bed. The wrong-way behavior refers to a transient temperature rise in the bed induced by a sudden reduction in the feed temperature. The cold feed cools the upstream section of the bed, and decreases the reaction rate and the conversion in this region, the cold fluid with higher than usual concentration of unconverted reactant eventually

contacts hot catalyst particles in downstream section of the bed. This leads to very rapid reaction and a vigorous rate of heat release, which causes a transient temperature rise. The wrong-way behavior may damage the catalyst and initiate undesired side reactions and may lead to unexpected pitfalls in the operation and control and even to a runaway. The goal of this work is to assess the wrong-way behavior of the F-T reactor and the impact of the water-gas shift side-reaction on the wrong-way behavior

CC *010408; 030400; 100200
CT CHEMICAL REACTION KINETICS; CHEMICAL REACTORS; COAL; FISCHER-TROPSCH SYNTHESIS; FLUID MECHANICS; NATURAL GAS; SHIFT PROCESSES; TEMPERATURE CONTROL; TEMPERATURE DISTRIBUTION; WATER GAS PROCESSES
BT CARBONACEOUS MATERIALS; CHEMICAL REACTIONS; CONTROL; ENERGY SOURCES; FLUIDS; FOSSIL FUELS; FUEL GAS; FUELS; GAS FUELS; GASES; KINETICS; MATERIALS; MECHANICS; REACTION KINETICS
ET F*T; F-T

L163 ANSWER 13 OF 36 ENERGY COPYRIGHT 2010 USDOE/IEA-ETDE on STN
AN 1997(1):3691 ENERGY Full-text
TI A periodic flow reversal reactor: an infinitely fast switching model and a practical proposal for its implementation.
AU Sun, Q.; Young, D. F.; Williams, D. F.; Glasser, D.; Hildebrandt, D. (Witwatersrand Univ., Johannesburg (South Africa))
NR CONF-9509333--
SO Canadian Journal of Chemical Engineering (Oct 1996) v. 74(5) p. 729-734.
Conference: 2. international conference on unsteady state processes in catalysis, St. Louis, MO (United States), 10-13 Sep 1995
CODEN: CJCEA7 ISSN: 0008-4034
DT Journal; Conference
CY Canada
LA English
FA AB
AB An internally consistent model of a catalytic reactor was constructed which assumed plug-flow of the gas, and by having different gas and solid temperatures, allowed for heat transfer between the gas and the solid. Because of the temperature difference even relatively slow periodic flow reversal approximates infinite switching. It was shown that under certain circumstances this reactor can achieve higher conversion rates in a given volume of catalyst than an adiabatic plug-flow reactor for exothermic reversible reactions. In addition, such a reactor has the advantage that no preheating (or at least less preheating) of the feed is required as the catalyst acts as a regenerative heat exchanger. This could be of considerable importance since the maximum conversion that can be achieved is determined by the amount of heat added to the reactor system. Suggestions for practical implementation of the infinitely fast switched reactor were provided. 12 refs., 5 figs.
CC *400201; 420200
CT CATALYSIS; CHEMICAL REACTIONS; CHEMICAL REACTORS; CYCLIZATION; FLUID FLOW; HEAT TRANSFER; PACKED BEDS
*CHEMICAL REACTORS; *CYCLIZATION
BT CHEMICAL REACTIONS; ENERGY TRANSFER

L163 ANSWER 14 OF 36 ENERGY COPYRIGHT 2010 USDOE/IEA-ETDE on STN
AN 1989(8):46034 ENERGY Full-text
TI Vertical reactor for catalytic exothermal and endothermal reactions, particularly for the manufacture of methanol, ammonia, synthetic gas and high alcohols.
Stehender Reaktor fuer katalytische exotherme und endotherme Reaktionen, insbesondere zur Herstellung von Methanol, Ammoniak, Synthesegas und hoeheren Alkoholen.

AU Vollhardt, F.; Kraemer, H.D. [Germany,Federal Republic of]
CS M.A.N. Gutehoffnungshuette G.m.b.H., Oberhausen (Germany, F.R.) (9203250)
Assignee(s): M.A.N. Gutehoffnungshuette G.m.b.H., Oberhausen (Germany, F.R.).
PI DE 3605792 A1 2 Apr 1987
8 p. DE priority 3534402.4.
PRAI 27 Sep 1985
DT Patent
CY Germany,Federal Republic of
LA German
AB The invention concerns a vertical reactor with a housing accomodating the catalyst bed and the housing parallel to its heat exchanger pipes passing through its longitudinal axis and forming a bundle of pipes, with a floor permeable to gas carrying the catalyst bed and with a housing hood and incoming and outgoing pipes passing through the housing floor for the coolant or heating medium, which open into horizontal distributor and collector pipes and with incoming and outgoing pipes for the reaction gas. It is characterized by the fact that the upper and lower ends of largely straight heat exchanger pipes of the bundle of pipes open into parallel horizontal support pipes situated below and above the collector or distributor pipes which are connected via intermediate pipes to the symmetrically arranged collector or distributor pipes or the latter pipes situated in the centre of cross section of the support pipes.
IC B01J008-06; C07C031-04; C01C001-00
CC *090221; 400201
CT *CHEMICAL REACTORS: *DESIGN; CATALYSIS; CHEMICAL REACTIONS; COOLING; DISTRIBUTION; DUCTS; HEATING; TUBES

L163 ANSWER 15 OF 36 ENERGY COPYRIGHT 2010 USDOE/IEA-ETDE on STN
AN 1989(8):45304 ENERGY Full-text
TI Catalytic gas synthesis apparatus.
AU Osman, R.M.; Shulik, L.J. [United States]
CS Assignee(s): Exxon Research and Engineering Co., Florham Park, NJ
PI US 4789527 6 Dec 1988
v p. Availability: Patent and Trademark Office, Box 9, Washington, DC 20232.
AI 21 Jan 1987
DT Patent
CY United States
LA English
AB This patent describes an exothermic catalytic reactor having at least two catalytic beds arranged for sequential gas flow therethrough; gas supply means for introducing a gas feedstream to the first of the catalyst beds for partial reaction of the gas feedstream therein; interbed gas cooling means for cooling the gas effluent from each catalyst bed to remove heat therefrom prior to passing the gas effluent to the next of the sequentially arranged catalyst beds and means for removing a gaseous effluent from the last of such catalyst reactor beds as the gas product, the improvement wherein the reactor additionally comprises reheat exchange means constructed and arranged for heating at least a portion of the last catalyst bed effluent gas by indirect heat exchange with a heating fluid comprising at least a portion of the gaseous effluent from at least one other of the reactor beds prior to withdrawal of the product gas from the reactor.
IC B01J008-04
CC *020400
CT *PETROLEUM REFINERIES: *CHEMICAL REACTORS; *CHEMICAL REACTORS: *DEGASSING; CATALYSIS; CATALYSTS; DESIGN; GAS FLOW; GASEOUS WASTES; HEATING; PACKED BED; SYNTHESIS GAS
BT FLUID FLOW; FLUIDS; GASES; INDUSTRIAL PLANTS; WASTES

L163 ANSWER 16 OF 36 ENERGY COPYRIGHT 2010 USDOE/IEA-ETDE on STN
AN 1988(22):179094 ENERGY Full-text
TI Process and device for catalytic conversion of gases.
Verfahren und Vorrichtung zum katalytischen Umsetzen von Gasen.
AU Ludwig, G. [Germany,Federal Republic of]
CS Chemische Werke Huels A.G., Marl (Germany, F.R.) (1688000)
Assignee(s): Chemische Werke Huels A.G., Marl (Germany, F.R.).
PI DE 3508553 A1 11 Sep 1986
20 p.
AI 11 Mar 1985
DT Patent
CY Germany,Federal Republic of
LA German
AB Catalytic conversion of reactive gases whose temperatures have only been slightly raised by the exothermal reactions, i.e. whose temperatures are below the reaction onset temperature, takes place in a fixed-bed catalyst installed in a single casing together with a heat exchanger. The heat exchanger as well as the catalyst mass are crossed by ducts or have chambers which are periodically flowed through by the (cold) reactive gas and the (hot) converted gas. Both the heat exchanger and the catalyst mass can be rotated with regard to the gas inlet flow while the gas flow is deflected inside the casing. The device has no valves or flaps to obstruct the gas flow. The process can be applied to gases containing substances that can be oxidized with air, or NOx that can be reduced with ammonia.
IC B01J008-02; B01D053-36
CC *424000; 320305
CT *CHEMICAL REACTORS: *DESIGN; *CHEMICAL REACTORS: *GAS FLOW; *IMPURITIES: *GASES; *GASEOUS WASTES: *IMPURITIES; CATALYSIS; CATALYSTS; HEAT TRANSFER; OXIDATION; PACKED BED; REDUCTION; ROTATION; TEMPERATURE CONTROL
BT CHEMICAL REACTIONS; CONTROL; ENERGY TRANSFER; FLUID FLOW; FLUIDS; MOTION; WASTES
ET N*O; NOx; N cp; cp; O cp

L163 ANSWER 17 OF 36 ENERGY COPYRIGHT 2010 USDOE/IEA-ETDE on STN
AN 1984(23):182232 ENERGY Full-text
TI Heat exchange technique for olefin fractionation and catalytic conversion system.
AU Wright, B.S.; Hsia, C.H.; Owen, H. [United States]
CS Assignee(s): Mobil Oil Corp.
PI US 4450311 22 May 1984
v p. PAT-APPL-508907.
AI 29 Jun 1983
DT Patent
CY United States
LA English
AB A heat balanced technique is claimed for converting an olefinic feedstock comprising ethylene and C3+ olefins to heavier liquid hydrocarbon product in a catalytic exothermic process. Methods and means are provided for prefractionating the olefinic feedstock to obtain a gaseous stream rich in ethylene and a liquid stream containing C3+ olefin, and contacting an olefinic feedstock stream from the prefractionating step with ZSM-5 type oligomerization catalyst in a series of exothermic catalytic reactors to provide a heavier hydrocarbon effluent stream comprising distillate, gasoline and lighter hydrocarbons. In a preferred embodiment a catalytic system is provided for making gasoline or diesel fuel from an olefinic feestock containing ethylene and C3+ lower olefins comprising a prefractionation system for separating and recovering ethylene and a liquid stream rich in C3+ olefins; a multi-stage adiabatic downflow reactor system operatively

connected for serially contacting olefinic feedstock with a plurality of fixed shape selective oligomerization catalyst beds; means for thermally exchanging hot reactor effluent from at least one catalyst bed with at least a portion of a prefractionation liquid stream for reboiling the liquid stream; and means for recovering gasoline and diesel product from the catalytic system.

IC C07C002-00
CC *020400
CT *GASOLINE: *CHEMICAL PREPARATION; *DIESEL FUELS: *CHEMICAL PREPARATION; *ETHYLENE: *FRACTIONATION; *CHEMICAL REACTORS: *HEAT TRANSFER; BOILING; CATALYSIS; ZEOLITES
BT ALKENES; ENERGY TRANSFER; FUELS; HYDROCARBONS; INORGANIC ION EXCHANGERS; ION EXCHANGE MATERIALS; LIQUID FUELS; MATERIALS; MINERALS; ORGANIC COMPOUNDS; PETROLEUM PRODUCTS; PHASE TRANSFORMATIONS; SEPARATION PROCESSES; SYNTHESIS
ET C3; C3+; C3 ip 1; ip 1

L163 ANSWER 18 OF 36 ENERGY COPYRIGHT 2010 USDOE/IEA-ETDE on STN
AN 1983(10):82838 ENERGY Full-text
TI Fluid catalytic cracking.
AU Penick, J.E. [United States]
CS Assignee(s): Mobil Corp
PI US 4376697 15 Mar 1983
v p. PAT-APPL-308076.
AI 1 Oct 1981
DT Patent
CY United States
LA English
AB Modifying a heat balanced operating fluid catalytic cracking (fcc) system to utilize a platinum group metal modified cracking catalyst, whereby increasing the heat generated in the exothermic regeneration of coked catalyst, and to provide a regenerated catalyst heat exchange cooler to permit adjustment of cracking conditions independent of the extra heat produced in the regeneration of catalyst.
IC C10G011-05
CC *020400; 400201
CT *CATALYTIC CRACKING: *FLUIDIZED BED; *CATALYSTS: *REGENERATION; COKE; COMBUSTION; COOLING; HYDROCARBONS; PLATINUM
BT CHEMICAL REACTIONS; CRACKING; DECOMPOSITION; ELEMENTS; METALS; ORGANIC COMPOUNDS; OXIDATION; PLATINUM METALS; PYROLYSIS; THERMOCHEMICAL PROCESSES; TRANSITION ELEMENTS

L163 ANSWER 19 OF 36 PASCAL COPYRIGHT 2010 INIST-CNRS. ALL RIGHTS RESERVED. on STN
AN 2003-0169250 PASCAL Full-text
CP Copyright .COPYRGT. 2003 INIST-CNRS. All rights reserved.
TIEN A novel reverse flow **reactor** coupling endothermic and **exothermic reactions**: an experimental study
AU VAN SINT ANNALAND M.; NIJSSEN R. C.
CS Department of Chemical Technology, University of Twente, P.O. Box 217, 7500 AE, Enschede, Netherlands
SO Chemical engineering science, **(2002)**, 57(22-23), 4967-4985, 19 refs.
ISSN: 0009-2509 CODEN: CESCAC
DT Journal
BL Analytic
CY United Kingdom
LA English
AV INIST-7538, 354000106702800240

AB A new reactor concept is studied for highly endothermic heterogeneously catalysed gas phase reactions at high temperatures with rapid but reversible catalyst deactivation. The reactor concept aims to achieve an indirect coupling of energy necessary for endothermic reactions and energy released by exothermic reactions, without mixing of the endothermic and exothermic reactants, in closed-loop reverse flow operation, i.e. with incorporation of regenerative heat exchange inside the reactor via periodic gas flow reversals. In a small laboratory scale reactor the concept of this "reaction coupling reverse flow reactor" (RCRFR) has been investigated experimentally for the propane dehydrogenation coupled with methane combustion over a monolithic catalyst, aiming for a proof of principle. Despite the inherently and inevitably large influences of radial heat losses on the axial temperature profiles in a laboratory scale reactor , as shown with some experiments with propane and methane combustion in reverse flow without propane dehydrogenation reaction steps, the experimental results show that indeed endothermic and exothermic reactions can be integrated inside the reactor together with recuperative heat exchange. The periodic steady state was easily obtained without any problems associated with process control. Furthermore, intermediate flushing with nitrogen between the propane dehydrogenation and methane combustion steps could be safely omitted. However, it was necessary to reduce the oxygen concentration during the methane combustion steps in order to avoid too high temperatures due to local combustion of carbonaceous products in the washcoat deposited during the preceding propane dehydrogenation reaction step. Propane dehydrogenation experiments in a reactor filled entirely with active catalyst demonstrated the seriousness of "back-conversion", a term used to indicate the loss of propane conversion due to propylene hydrogenation because of the low exit temperatures. Experiments performed in a reactor with inactive sections flanking the active catalyst section at both ends showed that the back-conversion could be effectively counteracted.

CC 001D07H; Applied sciences; Chemical engineering; Chemical reactors
001C01A03B; Chemistry; General chemistry, Physical chemistry; Catalysis

CT Dehydrogenation; Endothermic reaction; Hydrocarbon; Propane; Catalytic reaction; Heterogeneous catalysis; Supported catalyst; Monolithic construction; Platinum; Catalyst activity; Deactivation; Combustion; Exothermic reaction; Methane; Successive reaction; Irreversible reaction; Energy conservation; Heat recovery; Multifunctional reactor ; Catalytic reactor; Fixed bed reactor; Heat exchanger; Regenerative heat exchanger; Gas solid; Periodic behavior; Gas flow; Reversed flow; Performance; Heat transfer; Temperature distribution; Experimental study

BT Transition metal; Platinoid

L163 ANSWER 20 OF 36 PASCAL on STN

AN 2002-0072837 PASCAL Full-text

TIEN Design of cooled tubular reactor systems

AU LUYBEN William L.

CS Department of Chemical Engineering, Lehigh University, Bethlehem, Pennsylvania 18015, United States

SO Industrial & engineering chemistry research, (2001), 40(24), 5775-5783, 11 refs.
ISSN: 0888-5885 CODEN: IECRED

DT Journal

BL Analytic

CY United States
LA English
AV INIST-120F, 354000099357020130
AB Tubular reactors in which exothermic reactions take place sometimes are operated adiabatically and sometimes are cooled. Adiabatic operation makes reactor design easier because tube geometry can be selected simply on the basis of pressure drop considerations. Steady-state temperature profiles in adiabatic reactors increase monotonically. The design of cooled tubular reactors, however, involves complex tradeoffs between tube geometry, pressure drop, and heat-transfer area. Temperature profiles typically exhibit a peak at some axial position. This paper considers the impact of these interacting parameters on the optimum steady-state economic design of the entire plantwide process. The system studied has an exothermic, irreversible, gas-phase reaction A+B C occurring inside the tubes of a packed plug-flow tubular reactor. Steam is generated on the shell side to remove heat. The process consists of a reactor, feed-effluent heat exchanger, furnace, partial condenser, separator, and recycle compressor. Pressure drop through the reactor is important because of compression costs of the gas recycle and is reduced by using large-diameter tubes because of the smaller velocities. Heat removal is also important in cooled reactors and is improved by using small-diameter tubes because of their larger heat-transfer area-to-volume ratio. This paper presents a design methodology for considering all these complex tradeoffs. After specifying a reasonable tube length and fixing the maximum peak temperature, the two design degrees of freedom chosen are tube diameter and reactor pressure drop. The economic objective function is to minimize the total annual cost of the process: the annual capital cost of the reactor, catalyst, compressor, heat exchanger, and furnace; and the operating cost of the compressor and furnace. The method calculates the optimum tube diameter, reactor pressure drop, amount of catalyst, coolant temperature, number of tubes; and recycle flow rate. Results show that optimum designs of systems with small specific reaction rates feature large reactors and large recycle flow rates, which dictate the use of larger tube diameters and smaller pressure drops over the reactor. As specific reaction rates increase, reactor size and recycle flows decrease, which leads to optimum designs with smaller tube diameters and larger reactor pressure drops.
CC 001D07H; Applied sciences; Chemical engineering; Chemical reactors
CT Catalytic reactor; Fixed bed reactor; Tubular reactor; Gas solid; Cooling; Plug flow; Exothermic reaction; Gaseous phase reaction; Irreversible reaction; Optimal design; Optimization; Hydrodynamics; Pressure drop; Heat transfer; Theoretical study

L163 ANSWER 21 OF 36 PASCAL on STN
AN 1999-0411087 PASCAL Full-text
CP
TIEN Control of an autothermal network of nonstationary catalytic reactors
AU BARRESI A. A.; VANNI M.; BRINKMANN M.; BALDI G.
CS Dip. Scienza dei Materiali e Ingegneria Chimica, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 Torino, Italy
SO AIChE journal, (1999), 45(7), 1597-1602, 7 refs.
ISSN: 0001-1541 CODEN: AICEAC
DT Journal
BL Analytic
CY United States
LA English
AV INIST-7678, 354000085820590210

AB The aim of this work is to investigate by simulation the influence of the control policy on the performance and stability of a network of three reactors; the autothermal behavior with low exothermal reactions will be considered. The catalytic combustion of waste gases containing a low concentration of volatil organic compounds in adiabatic reactors will be investigated in detail; this is a simplified approach to the problem, and for this reason the heat losses at the wall have been neglected, but this is reasonable for commercial-size reactors. Because a large part of the bed acts as a heat exchanger, it can be replaced by inert material: in the case studied, only a small end section of the bed is catalytically active. It will be shown that the use of a fixed switching time is generally not appropriate for the reactor network; a more robust periodic strategy using a two-point temperature control must be implemented in order to assure safe startup and stability in case the load varies.

CC 001D07H; Applied sciences; Chemical engineering; Chemical reactors
001D16C05A; Applied sciences; Pollution, Nuisances; Atmospheric pollution

CT Flue gas purification; Physicochemical purification; Volatile organic compound; Catalytic combustion; Oxidation; Catalytic reaction; Catalytic reactor; Fixed bed reactor; Autothermic reactor; In series; Unsteady state; Process control; Performance; Stability; Temperature distribution; Concentration distribution; Modeling; Mathematical model; One dimensional model; Numerical simulation

L163 ANSWER 22 OF 36 PASCAL on STN

AN 1998-0036349 PASCAL Full-text

TIEN Catalytic combustion in a reactor with periodic flow reversal. Part 2. Steady-state reactor model

AU ZUFLE H.; TUREK T.

CS ABB Umwelttechnik GmbH, D-35502 Butzbach, Germany, Federal Republic of; Institut fuer Chemische Verfahrenstechnik, Universitaet Karlsruhe (TH), D-76128 Karlsruhe, Germany, Federal Republic of

SO Chemical engineering and processing, (1997), 36(5), 341-352
ISSN: 0255-2701 CODEN: CENPEU

DT Journal
BL Analytic
CY Switzerland
LA English
SL English
AV INIST-15544B, 354000068034080004

AB Copyright (c) 1997 Elsevier Science S.A. All rights reserved. Analysis of the reverse-flow reactor and comparison to a conventional adiabatic fixed bed reactor with external heat exchanger has shown that both systems are closely related. The required additional system parameter is the center of gravity of energy release caused by exothermic chemical reaction, which can also be rationalized as the mean fraction of the reverse-flow reactor acting as a regenerative heat exchanger. A simple steady-state countercurrent reactor model that is capable of describing the influence of adiabatic temperature rise and heat transfer properties of the fixed bed of catalyst on mean reactant conversion and temperature profile in cycle steady state is proposed. Generally, the agreement between calculated and experimentally determined parameters is satisfying. While discrepancies occur in the case of carbon monoxide oxidation, reactant conversion and maximum temperature as well as the minimum concentration for stable operation in cycle steady state are accurately predicted for the oxidation of propane. .COPYRGT. 1997 Elsevier Science S.A.

CC 001D16C05B; Applied sciences; Pollution, Nuisances; Atmospheric pollution
CT Flue gas purification; Physicochemical purification; Volatile organic compound; Carbon monoxide; Hydrocarbon; Alkane; Propane; Catalytic combustion; Catalytic reactor; Fixed bed reactor; Periodic behavior; Reversed flow; Modeling; Static model; Temperature distribution; Kinetics; Thermal instability; Theoretical study

L163 ANSWER 23 OF 36 PASCAL
AN 1996-0275963 PASCAL Full-text

TIEN Simulation studies of autothermal reactor system for H.sub.2 production from methanol steam reforming
AU MA L.; JIANG C.; ADESINA A. A.; TRIMM D. L.; WAINWRIGHT M. S.
CS School of Chemical Engineering and Industrial Chemistry, University of New South Wales, Sydney, NSW, 2052, Australia
SO Chemical engineering journal and the biochemical engineering journal, (1996), 62(2), 103-111, 13 refs.
ISSN: 0923-0467 CODEN: CMEJAJ
DT Journal
BL Analytic
CY Switzerland
LA English
AV INIST-14678, 354000043613180030
AB Steam reforming of methanol is a principal route for the production of hydrogen. Owing to the high endothermicity of this reaction, attention must be directed at energy-saving measures to improve production economics. However, the novel concept involving the coupling of the oxidation of the methanol (a strongly exothermic step) to the steam reforming reaction is an intuitively attractive operation for energy minimisation. This paper reports the results of a mathematical investigation on the performance of a class of adiabatic dual-bed catalytic reactor systems with cylindrical and spherical geometries that may be used to promote internal heat exchange for the coupled reaction network. Analysis shows that, while the coaxial cylindrical system and the dual-bed single tubular reactor generally need optimal water-to-methanol feed ratios of about 3-4, the spherical arrangement always requires a ratio less than 1 for equivalent or even better performance. The spherical reactor system in which the oxidation catalyst was placed in the inner sphere with steam reforming in the annular space showed the most promising performance in terms of reactor efficiency (about 80%) and H.sub.2 production (125 m.sup.3 gas/(m.sup.3 reactor) s) while the coaxial reactors exhibited the poorest efficiency (less than 10%) for a H.sub.2 production rate of 19.5 m.sup.3 gas/(m.sup.3 reactor) s. Thus the spherical reactor with an inner oxidation catalyst bed is the most attractive configuration for this autothermal process in terms of product maximization, feed and energy minimization.
CC 001D08A02; Applied sciences; Chemistry; Chemical industry
CT Hydrogen; Steam reforming; Oxidation; Primary alcohol; Methanol; Autothermic reactor; Catalytic reactor; Modeling; Mathematical model; Performance

L163 ANSWER 24 OF 36 PASCAL
AN 1992-0374928 PASCAL Full-text
TIEN Analysis of an exothermic reversible reaction in a catalytic reactor with periodic flow reversal
AU YOUNG B.; HILDEBRANDT D.; GLASSER D.
CS Univ. Witwatersrand, dep. chemical eng., Johannesburg, South Africa

SO Chemical engineering science, (1992), 47(8), 1825-1837, 10 refs.
ISSN: 0009-2509 CODEN: CESCAC
DT Journal
BL Analytic
CY United Kingdom
LA English
AV INIST-7538, 354000028330940020
AB Periodic flow reversal in a packed catalytic reactor in which a reversible exothermic reaction is occurring is studied using a simplified mathematical model. Model simulations are firstly performed for a single reactor and the influence of cycle time and the use of inert sections on the ends of the reactor, which act as regenerative heat exchangers, are studied. It is shown that the volume of the inert sections can be used to control the temperature profile in the reactor. The performance of this reactor is compared to a conventional steady-state adiabatic reactor in which the feed is preheated using a heat exchanger. The cycled reactor is shown to give a better conversion for the same catalyst volume. In order to approximate the optimal temperature profile more closely, a two-stage cycled reactor, each with inert sections, is studied. This arrangement is shown to have a higher average conversion than an optimally operated two-stage steady-state reactor with interstage cooling. Suggestions are made for future work in this area
CC 001D07H; Applied sciences; Chemical engineering; Chemical reactors
CT Theoretical study; Fixed bed catalytic reactor; Recycle reactor; Packed bed; Reversible reaction; Exothermic reaction ; Mathematical model; Temperature distribution

L163 ANSWER 25 OF 36 JAPIO (C) 2010 JPO on STN
AN 2004-074152 JAPIO Full-text
TI HOLLOW PELLET SUITABLE AS A CARRIERS FOR CATALYST FOR SELECTIVE EXOTHERMIC REACTION
IN MARSELLA ANDREA; VIDOTTO SANDRO; CREMASCHI BARBARA
PA EVC TECHNOLOGY AG
PI JP 2004074152 A 20040311 Heisei
AI JP 2003-283606 (JP2003283606 Heisei) 20030731
PRAI EP 2002-255354 20020731
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2004
IC ICM B01J0035-02
ICS B01J0027-122; C07C0017-02; C07C0019-045
ICA C07B0061-00
AB PROBLEM TO BE SOLVED: To provide a catalyst hollow pellet for selective gas phase exothermic reactions in a tubular fixed bed reactor. SOLUTION: The catalyst hollow pellet, which has an external section of a parallelogram having a specified shape dimension and a low fluidity resistance, is excellent in heat exchange between it and the wall of an industrial reactor, provides a pellet excellent in mechanical resistance and guarantees a high total active phase content of the reactor. Especially, an excellent catalyst for an oxychlorination fixed bed process is obtained by the suitable active phase based on copper and additives and an excellent catalyst for an selective oxidation process is obtained by the suitable active phase based on silvers and additives. COPYRIGHT: (C)2004,JPO

L163 ANSWER 26 OF 36 JAPIO (C) 2010 JPO on STN
AN 1999-236215 JAPIO Full-text
TI PRODUCTION OF PRUSSIC ACID BASED ON ANDRUSSOW PROCESS
IN HIPPEL LUKAS VON DR; ARNTZ DIETRICH DR; SAUER MANFRED DR; VANHEERTUM RUDOLF DR
PA DEGUSSA AG

PI JP 11236215 A 19990831 Heisei
AI JP 1998-348689 (JP10348689 Heisei) 19981208
PRAI DE 1997-19754988 19971211
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1999
IC ICM C01C0003-02
AB PROBLEM TO BE SOLVED: To preferably control the exothermic reaction and to easily assemble into a large-size device by using the reaction heat generated in the reaction to heat the starting gas to the required reaction temperature by indirect heat exchange based on the countercurrent principle.
SOLUTION: As for the reactor, a reversal countercurrent reactor consisting of two concentric tubes comprising a tightly sintered aluminum oxide ceramic material is used. The inner tube 1 is equipped with a catalyst bed 3 at the upper end part, while the outer tube 2 is closed at the top end, namely, the top of the reactor. When the starting gas mixture is introduced from the lower side to the inner tube 1, the mixture passes through the catalyst bed 3 and turns downward in the ringlike space between the inner tube 1 and the outer tube 2. At the initiation of the reaction, it is necessary to heat the starting gas mixture and the catalyst to >=800°C. This heating process is carried out by direct heating of the catalyst by a heater jacket or a current surrounding the outer tube 2. After the reaction is initiated, it is enough to use the generated reaction heat to heat the starting gas mixture to the reaction temperature COPYRIGHT: (C)1999,JPO

L163 ANSWER 27 OF 36 JAPIO (C) 2010 JPO on STN
AN 1991-271245 JAPIO Full-text
TI APPARATUS FOR EXOTHERMIC REACTION
IN TAMAGAWA MASAKAZU; SHIMA KAZUMI
PA TOYO ENG CORP
PI JP 03271245 A 19911203 Heisei
AI JP 1990-65728 (JP02065728 Heisei) 19900316
PRAI JP 1990-65728 19900316
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1991
IC ICM C07C0047-055
ICS C07C0045-38
ICA C07B0061-00
AB PURPOSE: To increase the quenching effect of a reaction product gas, to suppress the formation of by-products and improve the reaction yield by placing a plate- type quenching heat-exchanger immediately below a flat-plate catalyst-supporting bed and installing a plate-type secondary heat-exchanger subsequent to the quenching heat-exchanger.
CONSTITUTION: Raw material gas is supplied from a nozzle 10 through a number of blasting ports 12 and reacted by passing through a stationary catalyst layer 16 placed on a gas-permeable catalyst-supporting bed 18. The reaction gas converted to the objective substance and heated at a high temperature by the reaction heat is sent to a quenching part 240 composed of a plate-type, preferably a plate-fin type heat-exchanger placed immediately below the supporting bed 18 and quenched to prevent the side reactions and/or thermal decomposition of the reaction product gas. The quenched gas is supplied to the secondary cooling part 250 for heat-recovery and recovered from an outlet 34.
COPYRIGHT: (C)1991,JPO&Japio

L163 ANSWER 28 OF 36 JAPIO (C) 2010 JPO on STN
AN 1985-153936 JAPIO Full-text
TI REACTOR WITH HEAT PIPE
IN ARISAKI KENJI
PA BABCOCK HITACHI KK
PI JP 60153936 A 19850813 Showa
AI JP 1984-11437 (JP59011437 Showa) 19840125

PRAI JP 1984-11437 19840125
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1985
IC ICM B01J0008-06
ICS F28D0015-02
AB PURPOSE: To reduce installation cost, in a reactor such as a shift converter used in an ammonia synthesis process, by packing the outside annular part in a cylindrical reaction vessel concentrically partitioned by partition plate with a catalyst and mounting heat pipes in said reaction vessel. CONSTITUTION: Reaction gas 27 is introduced into the outside annular part 30 in a reaction vessel main body 20 from an inlet nozzle 26 and uniformly distributed to the upper surface of a catalyst bed 22 and generates exothermic reaction in a process downwardly flowing through the catalyst bed 22 while reaction heat is successively absorbed by heat pipes 34 and irreversibly transmitted to the heat exchange medium in an inside cylindrical part 38. The gas having received reaction passes the support plate 35 provided to the lower part of the catalyst bed 22 to be exhausted to a gas chamber 29 and taken out to the outside as reaction gas from said chamber 29 through an outlet nozzle 31. Water is supplied into the inside cylindrical part 21 from a water falling pipe nozzle 25 through a water falling pipe 25 and supplied to a boiler system while successively heated by the heat pipes 34. COPYRIGHT: (C)1985,JPO&Japio

L163 ANSWER 29 OF 36 JAPIO (C) 2010 JPO on STN
AN 1979-126671 JAPIO Full-text
TI CATALYSTICALLY OXIDIZING UNIT
IN IZUMO MASAKADO; KOMURA MASAHARU; KAMETANI KEIICHIRO
PA DAIKIN IND LTD
PI JP 54126671 A 19791002 Showa
AI JP 1978-34758 (JP53034758 Showa) 19780325
PRAI JP 1978-34758 19780325
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1979
IC ICM B01D0053-34
AB PURPOSE: To enhance heat recovering rate by alternately superposing many flat and corrugated plates of a square including a rectangle so that the corrugated directions meet at right angles by turns; passing a gas to be treated through the resulting honeycomb-shaped catalyst bed from a side; and then passing the gas from other side intersecting perpendicularly to the first side. CONSTITUTION: Oxidation catalyst is attched to a honeycomb structure having passes intersecting perpendicularly by turns, and the resulting heat exchange type catalyst bed A is set in the center of shell 3. A gas to be oxidized is introduced from the A1 side of primary introduction chamber 4 through pipe 8 with blower 9 and taken out form the A2 side of primary taking-out chamber 5. The gas is then passed through the bed from the A3 side of secondary introduction chamber 6 to the A4 side of secondary taking-out chamber 7. Exothermic oxidation reaction takes place between the A1 and A2 sides, the residue is oxidized between the A3 and A4 sides, and exhaust gas is released from pipe 10. By this method a catalyst bed and a heat exchanger are unified to enhance heat recovering rate to 75∼85%. COPYRIGHT: (C)1979,JPO&Japio

L163 ANSWER 30 OF 36 TEMA COPYRIGHT 2010 FIZ TECHNIK on STN
AN 20000801091 TEMA Full-text
TI Supermodeling reactors for profitability. Reactor modeling improves equipment design and optimizes performance. Understand how advances in reactor modeling can benefit your process in ways not previously available
Gewinnsteigerung durch Modernisierung von Reaktoren in der chemischen Verfahrenstechnik
AU Dutta, S.; Gualy, R.

CS GTC Technol., Houston, USA
SO Chemical Engineering, New York,
 2000, v. 107 (6), p72-79, 8pp,2fig.,5tab.,14ref.
 ISSN: 0009-2460
DT Journal
LA English
AB This paper desribes the prerequisites for building and implementing a reliable custom model of a reactor. It also provides examples where a well-tested general reactor model was applied to improve profitability. A extended schedule shows possibilities of reactor optimization in relation of design variables, such as reactor type, reactor size, tube diameter, reactor shape, feed, heat-transfer system and others, to several operating variables. Some common concerns and measures in reactor control and operation are presented by a further summary. This summary include fluidized catalytic converters, hydrotreaters, exothermic catalytic fixed-bed reactors, turbulent fluidized bed reactors (gas-solid), circulating fluidized bed reactors (gas-solid), liquid-gas, liquid-solid and three-phase reactors, and stirred-tank reactors . For reactor optimization, a novel concept called process intensification (PI), is emerging as the way to effect a dramatic change or improvement in process and plant energy consumption and other performance parameters. This technology trend involves the use of membrane reactors, microreactors, multifunctional reactors (for instance, ones capable of carrying out reaction, heat transfer and sparation within a single unit), compact heat exchangers, alternate energy sources, process integration and plant-size miniaturization. Alternate forms of energy include centrifugal fields, ultrasound, solar energy, microwave energy, plasma and other non-conventional sources. Needs, challenges and rewards in reactor revamp and modernization are listed. The implementation of a general reactor model can prove to be a prompt and cost-effective starting point for building a custom model. A general model should contain most of the following elements, namely material and energy balances; interaction of reaction kinetics with heat- and mass-transfer and diffusion phenomena; correlations for the rates of heat and mass transfer and diffusion; hydraulics and hydrodynamics of most known reactor configurations; interaction of reaction kinetics with reactor hydrodynamics; effects of heat and mass dispersions (axial or radial) on reactor performance; methods to account for physical property changes and phase-transfer behaviours; mathematical routines for simultaneous solution of equations and parameter estimations.
CT CHEMICAL-ENGINEERING; PROCESS-OPTIMISATION; PROCESS-ANALYSIS; PROCESS-MODEL; MANUFACTURING-PROCESS-MONITORING; PARAMETER-IDENTIFICATION; MODERNIZATION; RECONSTRUCTION
ST Reaktionsgefaess, Chemieanlage, Modernisierung

L163 ANSWER 31 OF 36 DISSABS COPYRIGHT (C) 2010 ProQuest Information and Learning Company; All Rights Reserved on STN
AN 2009:59072 DISSABS Order Number: AAI3353701
TI Dynamics of countercurrent flow and reverse-flow reactors
AU Garg, Rohit [Ph.D.]; Luss, Dan [advisor]
CS University of Houston (0087)
SO Dissertation Abstracts International, (2002) Vol. 70, No.
 4B, p. 2429. Order No.: AAI3353701. 178 pages.
 ISBN: 978-1-109-10223-9.
DT Dissertation
FS DAI
LA English
ED Entered STN: 20091122
 Last Updated on STN: 20091122
AB Autothermal reactors are a class of reactors in which the heat of reaction is utilized to heat the reactor feed to the ignition temperature of the catalyst. A recent development of the autothermal

operation is the utilization of recuperative heat exchange in a countercurrent flow reactor and regenerative heat exchange in a reverse-flow reactor. In a countercurrent flow reactor (CFR) the reactants flow counter-currently at equal velocities and flow rates through two compartments, with negligible heat transfer resistance between the two sections. Two reactor configurations may be used. A "regular" one, in which the two compartments are fed by two separate feeds, and a "folded" configuration, in which a single feed flows first through one compartment and then reverses its direction and flows countercurrently in the second. The temperature and concentration profiles in the regular CFR configuration usually have mirror symmetry around its center. However, under cooling asymmetric steady states, complex periodic or even chaotic states may form. The imposed symmetry causes the steady-state and dynamic features of the folded CFR to be less complicated than those of the regular CFR. Reverse-flow reactor (RFR) is a packed bed reactor operated by periodically reversing the flow direction of the gas in order to trap the heat in the bed. The adsorption on the catalyst surface of the product of an exothermic reaction in an RFR may lead to large variations in the temporal effluent product concentration. A cooled RFR may attain, for certain parameter values, complex dynamic states such as quasi-periodic and chaotic states. An increase in the adsorption capacity of the catalyst decreases the range of parameter values for which complex dynamic states exist. The desired period-1 operation of the RFR is more robust in the presence of product adsorption. Product adsorption may lead to surprising dynamic features such as the coexistence of up to three stable quasi-periodic states for the same operating conditions. A very fast switching RFR can be modeled by a CFR. Thus, the analysis of a CFR provides us a quick and easy way of understanding similar dynamics observed in an RFR.

CC 0542 ENGINEERING, CHEMICAL

L163 ANSWER 32 OF 36 DISSABS COPYRIGHT (C) 2010 ProQuest Information and Learning Company; All Rights Reserved on STN

AN 96:39378 DISSABS Order Number: AAI9619505

TI REVERSE FLOW OPERATION OF PACKED-BED REACTORS WITH DISCRETE ENERGY AND MASS DISTRIBUTION

AU SNYDER, JON DUKELOW [PH.D.]; SUBRAMANIAM, BALA [advisor]

CS UNIVERSITY OF KANSAS (0099)

SO Dissertation Abstracts International, (1995) Vol. 57, No. 2B, p. 1264. Order No.: AAI9619505. 275 pages.

DT Dissertation

FS DAI

LA English

ED Entered STN: 19960708
Last Updated on STN: 19960708

AB It has been shown that the energy efficiency of packed- bed reactors with mildly exothermic reactions can be significantly improved through reverse flow operation. For such reactions, periodically reversing the direction of flow traps the heat of reaction in the central portion of the reactor, resulting in high reactor temperatures and a significant reduction of the feed preheat duty. Because of the narrow window of operating parameters, presently defined by reaction exothermicity, relatively few reactions can be considered for use in reverse flow reactors. This leads to several questions. Can discrete central introduction of energy and mass be utilized to take advantage of the trapping behavior associated with reverse flow operation and thereby widen the window? Can central energy introduction extend energy efficiency to even highly endothermic reactions? Analogously, can mass trapping be exploited to maximize adsorbate concentrations, efficiently utilizing available mass for rate limited reactions? It is theoretically

shown for the endothermic dehydrogenation of ethylbenzene, that by adding energy in the form of superheated steam at interior reactor locations, temperatures hundreds of degrees higher than the mixing cup temperature of the combined streams can be attained. Furthermore, by splitting steam introduction between multiple interior locations, nearly isothermal bed temperatures can be realized.
An experimental reverse flow heat exchanger was constructed. The effect of discrete energy distribution on energy trapping during reverse flow operation in the absence of reaction was experimentally investigated. It was found that while energy trapping is most efficient when added energy is introduced closer to the axial center, significant trapping is also attained during energy introduction closer to the ends. For the selective catalytic reduction of NO by NH$\sb3$ on a TiO$\sb2$/V$\sb2$O$\sb5$ catalyst, NH$\sb3$ strongly adsorbs onto the catalyst. It is theoretically shown that central introduction of NH$\sb3$ during reverse flow operation leads to mass trapping. Resulting higher adsorbate concentrations lead to faster reaction rates, efficiently utilizing the available mass.
These results indicate that it is possible to manipulate temperature profiles using discrete energy distribution during reverse flow operation. Also, it is indeed possible to trap an adsorbate in a manner analogous to energy trapping.

CC 0542 ENGINEERING, CHEMICAL

L163 ANSWER 33 OF 36 DISSABS COPYRIGHT (C) 2010 ProQuest Information and Learning Company; All Rights Reserved on STN

AN 86:32335 DISSABS Order Number: AAR8718002

TI DETECTING AND AVOIDING UNSTABLE OPERATION OF AUTOTHERMAL REACTORS

AU GUSCIORA, PAUL HENRY [PH.D.]

CS UNIVERSITY OF CALIFORNIA, BERKELEY (0028)

SO Dissertation Abstracts International, (1986) Vol. 48, No. 5B, p. 1433. Order No.: AAR8718002. 225 pages.

DT Dissertation

FS DAI

LA English

ED Entered STN: 19921118
Last Updated on STN: 19921118

AB A control system is developed that avoids unstable operation of autothermal chemical reactors. The exothermal reaction between hydrogen and oxygen occurs on catalyst in two fixed-bed chemical reactors coupled to an external feed-product heat exchanger . An optimization searches for values of process setpoints that maintain an acceptable, specified degree of stability. Two setpoints are adjusted to track feed changes. Process stability is inferred from the eigenvalues of a physically-based mathematical model of the reactor-exchanger system. The search for setpoint values is performed by an optimization procedure with a steady-state objective function. In this work, the objective function was fashioned to drive the setpoints toward unstable conditions. The search is constrained by stability constraints and process constraints. The stability constraints require the eigenvalues to lie to the left of a specified piecewise-linear curve in the complex plane.
The mathematical models of the reactor beds resulted in state-space models that were unwieldy for real-time computations in their original form. Novel application of the Taylor-dispersion approximation to the original partial differential equations results in a reduction of the number of state variables from 14 to 3-6.
Tests on a laboratory autothermal reactor show that changing the process setpoints influences the stability of the process. The model is able to give information about stability provided the model closely represents

the steady-state temperature profiles of the reactor system. A standard nonlinear optimization algorithm is able to find setpoint values that satisfy the stability and process constraints under changing conditions.

CC 0542 ENGINEERING, CHEMICAL

L163 ANSWER 34 OF 36 TULSA COPYRIGHT 2010 UTULSA on STN

AN 2001:17783 TULSA Full-text

DN 760111

TI SYNTHESIS GAS BY DIRECT OXIDATION OF METHANE IN A CATALYTIC HEAT-EXCHANGE REACTOR

AU FRIEDLE, U; VESER, G; SCHICKS, J

CS STUTTGART UNIV; MAX PLANCK INST

SO DGMK SYN. GAS CHEM. CONF. (Dresden, Germany, 9/27-29/2000) PROC. [DGMK MTG. REP. NO.2000-3] pp.23-30, 2000. (ISSN: 1433-9013; ISBN 3-931850-69-2)

DT Conference Article; Conference

LA English

ED Entered STN: 1 Aug 2001
Last Updated on STN: 1 Aug 2001

AB Despite intensive research efforts into the functionalization of natural gas, no commercially viable way has yet been found to functionalize methane via direct methanol synthesis or oxidative coupling of methane to higher hydrocarbons. Instead, the industrial process route remains based on the (indirect) functionalization by conversion of methane to synthesis gas and subsequent methanol synthesis or Fischer-Tropsch synthesis reactions. However, direct partial oxidation offers several advantages over conventional steam reforming, which make the process particularly attractive for syngas production outside the network of a major chemical production site. Due to the exothermicity of the direct oxidation route, the process can be conducted autothermally, i.e., no external heating or sacrificial combustion of methane is necessary. The high reaction temperatures result in very high reaction rates (as typical for catalytic oxidations) and correspondingly short contact times. The principle of a counter-current heat-exchange reactor is demonstrated. The improvement in efficiency of the direct oxidation of methane to synthesis gas without external preheat is described. Further improvements in reactor design are discussed.

CC PRODUCING OIL & GAS

SH *SYNTHESIS GAS

CT *ALKANE; *CATALYST; *CHEMICAL PROCESS; *CHEMICAL REACTION; *COMPOUND; *CONVERSION PROCESS; *GAS LIQUIDS CONVERSION; *HEAT EXCHANGER; *HYDROCARBON COMPOUND; *METHANE; *OXIDATION REACTION; *SATURATED HYDROCARBON; AIR; ALCOHOL; BOOK; CATALYSIS; CHANGE; CHART; CHEMICAL MODEL; CHEMICAL REACTOR; CHEMISTRY; CONSERVATION; CONVERSION; DATA; DESIGN; DIAGRAM; DISTRIBUTION; ECONOMIC FACTOR; ELEMENT (CHEMICAL); ENGINEERING; ENGLISH; EXPERIMENTAL DATA; FISCHER TROPSCH PROCESS; FIXED BED; FLUID; GAS; GRAPH; GROUP VIA; HEAT; HEAT OF REACTION; HEAT RECOVERY; HEAT TRANSFER; HIGH TEMPERATURE; LABORATORY TESTING; MEETING PAPER TEXT; METHANOL; MODEL; NATURAL GAS; OXYGEN; PETROLEUM; PHYSICAL PROPERTY; PROCESS DESIGN; PRODUCING OIL & GAS; RESEARCH; SELECTIVITY; SIMULATION; STEAM; STOICHIOMETRY; TEMPERATURE; TEMPERATURE DISTRIBUTION; TEMPERATURE EFFECT; TESTING; THERMODYNAMIC PROPERTY; THERMODYNAMICS; WASTE HEAT; WATER; WATER VAPOR

RN 7782-44-7 (OXYGEN)
8002-05-9 (PETROLEUM)
8006-14-2 (NATURAL GAS)
67-56-1Q, 73107-10-5Q (METHANOL)
74-82-8Q, 27936-85-2Q (METHANE)

L163 ANSWER 35 OF 36 TULSA COPYRIGHT 2010 UTULSA on STN
AN 1992:1650 TULSA Full-text
DN 517741
TI CATALYTIC DOWNHOLE REACTOR AND STEAM GENERATOR
IN GONDOUIN, M
PA S-CAL RESEARCH CORP
PI US 5052482 19911001
AI US 1990-510596 19900418
SO U.S. 5,052,482, c. 10/1/91, f. 4/18/90 (Appl. 510,596) (E21B-034/14; E21B-043/12; E21B-043/24). (23 pp; 19 claims)
DT Patent
LA English
ED Entered STN: 18 Nov 1996
Last Updated on STN: 18 Nov 1996
AB A down-hole catalytic methanator reactor assembly is hung within the cemented casing of a vertical well for the purpose of producing large volumes of high quality steam and oil soluble gases for injection into horizontal drainholes drilled into a deep heavy oil reservoir. Steam is generated in part by the heat of chemical reactions taking place within the reactor assembly. The exothermic methanation reaction takes place within a fixed bed of catalyst particles at a temperature below 800`F, when a syngas feed (H2, CO and CO2) comes in contact with the catalyst. Water supplied to the reactor assembly is vaporized. The reactor assembly may be located within a cemented metal-lined cavity under-reamed below a cased access well. For operating each of the horizontal drainholes successively in the cyclic (huff and puff) mode, a down-hole valve section is included in the assembly. Multi-way down-hole retrievable valves are used for this purpose.
IC ICM E21B0034-14
ICS E21B0043-12; E21B0043-24
IPC E21B0034-14; E21B0043-12; E21B0043-24
CC RESERVOIR ENG & REC METHOD
SH *DOWNHOLE STEAM GENERATOR
CT *BOILER; *CATALYST; *CHEMICAL PROCESS; *ENHANCED RECOVERY; *HEAT OF REACTION; *HEATING EQUIPMENT; *METHANATION; *PHYSICAL PROPERTY; *STEAM; *STEAM FLOODING; *STEAM INJECTION ; *THERMAL RECOVERY; *THERMODYNAMIC PROPERTY; *WATER; *WATER VAPOR; (P) USA; ALKALI METAL; ARTIFICIAL DRIVE; BOREHOLE; CARBON DIOXIDE; CARBON MONOXIDE; CATALYSIS; CHART; CHEMICAL REACTION ; CHEMICAL REACTOR; COMBUSTION PRODUCT; COMPOSITION; COMPOUND; CONTROL; CONTROL VALVE; CRUDE OIL; DIRECTIONAL WELL; DISPLACEMENT FLUID; DRAINHOLE; ELEMENT (CHEMICAL); ENGINEERING DRAWING; ENGLISH; FIXED BED; FLOW CONTROL; FLUID FLOW; FUEL; GAS FLOW; GASEOUS FUEL; GEOLOGIC STRUCTURE; HEAT EXCHANGER; HEAT TRANSFER; HEATING; HORIZONTAL WELL; HYDROGEN; IMMISCIBLE DISPLACEMENT; MANUFACTURED CRUDE OIL; MOUNTING; NATURAL GAS; OIL RECOVERY; OIL RESERVOIR; ORGANIC; OXIDE; PATENT; PETROLEUM; PIPING SYSTEM; PRODUCT; RESERVOIR; RESERVOIR ENG & REC METHOD; RESERVOIR HEATING; S-CAL RESEARCH CORP; STEAM QUALITY; SUBSURFACE; SUSPENSION DEVICE; SYSTEM (ASSEMBLAGE); TAR SAND OIL; TAR SAND OIL RECOVERY; TUBING; TUBING (WELL); TUBULAR GOODS; VALVE; VISCOSITY REDUCING; VISCOUS CRUDE OIL; VISCOUS OIL RECOVERY; WELL
RN 124-38-9 (CARBON DIOXIDE)
630-08-0 (CARBON MONOXIDE)
1333-74-0 (HYDROGEN)
8002-05-9 (PETROLEUM)
8006-14-2 (NATURAL GAS)
16833-27-5 (OXIDE)

L163 ANSWER 36 OF 36 TULSA COPYRIGHT 2010 UTULSA on STN
AN 1985:20516 TULSA Full-text

DN 391695
TI METHOD AND APPARATUS FOR RECOVERING HEAVY OIL
IN IDENO, E; TAMIYA, M; AOKATA, T; YAMAGATA, M
PI CA 1192486 19850827
AI CA 1983-422201 19830223
SO CAN 1,192,486, C 8/27/85, F 2/23/83 (APPL 422,201) (KOBE SEIKO SHO KK) (11 CLAIMS)
DT Patent
LA English
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AB A method and apparatus for recovering heavy oil from an oil well utilize thermal energy which is generated by methanation reaction of a mixture gas of CO and H2 in an underground methanator. The mixture gas is fed from a reactant gas circulating system on the ground into an underground steam generator located in the vicinity of an oil reservoir to undergo methanation reaction through a fixed catalyst bed provided in the steam generator. The product gas of the methanation reaction is returned to the overground circulating system through the top of the steam generator for heat exchange with the incoming mixture gas. Water is fed to the steam generator from a water source on the ground. The water is converted into steam by the exothermic heat of the methanation reaction. The steam is injected into the oil reservoir. (11 claims)
CC RESERVOIR ENG & REC METHOD
SH *RESERVOIR HEATING
CT *BOILER; *CHEMICAL PROCESS; *DOWNHOLE STEAM GENERATOR; *ENHANCED RECOVERY; *HEAT OF REACTION; *HEATING; *HEATING EQUIPMENT; *METHANATION; *OIL RECOVERY; *PHYSICAL PROPERTY; *STEAM FLOODING; *STEAM INJECTION; *THERMAL RECOVERY; *THERMODYNAMIC PROPERTY; *VISCOUS OIL RECOVERY; (P) CANADA; ALKALI METAL; ALKANE; CARBON MONOXIDE; CHART; CHEMICAL REACTION; COMPOUND; CRUDE OIL; DESIGN; DESIGN CRITERIA; DIAGRAM; DISPLACEMENT FLUID; ELEMENT (CHEMICAL); ENGINEERING; ENGINEERING DRAWING; ENGLISH; FLOW CHART; FLOW PROPERTY; GENERATOR; GEOLOGIC STRUCTURE; GRAPH; HEAT; HEAT EXCHANGER; HYDROCARBON COMPOUND; HYDROGEN; IMMISCIBLE DISPLACEMENT; INORGANIC; KOBE SEIKO SHO KK; LIQUID VISCOSITY; METHANE; OIL; OIL RESERVOIR; ORGANIC; OXIDE; PATENT; PETROLEUM; PETROLEUM ENGINEERING; PROCEDURE; PROCESS; PROCESS DESIGN; RESERVOIR; RESERVOIR ENG & REC METHOD; RESERVOIR ENGINEERING; SATURATED HYDROCARBON; SPECIFICATION; STEAM; SYSTEMS ENGINEERING; VISCOSITY; VISCOSITY REDUCING; VISCOUS CRUDE OIL; VISCOUS OIL; WATER; WATER VAPOR
RN 630-08-0 (CARBON MONOXIDE)
1333-74-0 (HYDROGEN)
8002-05-9 (PETROLEUM)
16833-27-5 (OXIDE)
74-82-8Q, 27936-85-2Q (METHANE)